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An Analysis of the Practice of Architecture and Engineering in Ontario

Prepared by
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for
The Professional Organizations Committee

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#1

AN ANALYSIS OF THE PRACTICE OF ARCHITECTURE AND ENGINEERING IN ONTARIO

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CHAPTER I

INTRODUCTION

A. BACKGROUND

This study was undertaken to examine various issues relative to the regulation of the practice of engineering and architecture in the Province of Ontario. It was commissioned by the Professional Organizations Committee established by the Attorney General of Ontario.

Several bodies of data have been analyzed in an attempt to derive answers to specific questions based upon the issues listed below. Major portions of the report present the factual information that has been gathered. Other portions of the report analyze specific issues in light of the information gathered, and attempt either to answer the questions directly or to identify the consequences of alternative courses of action. Thus the purpose of this report is not to decide the ultimate policy issues, but to provide some analytical information that would help others to decide those issues.

We have gathered some information on all aspects of the practice of architecture and engineering within the province. The practices, however, are enormously diverse, and it was felt important to focus upon some specific areas for more detailed analysis. We have chosen the field of building design for major emphasis in this report, with minor emphasis upon the design of transportation facilities. It is hoped that detailed analyses of these fields of practice will lead toward some reliable conclusions about these fields, which may or may

not be generalized to the other areas of practice. Building design was selected because it represents a major portion of the practice of both architects and engineers, and represents an area in which at least one major policy issue, the jurisdictional conflict between architects and engineers, is centred.

B. ISSUES ADDRESSED

The main body of this report consists of three chapters. Chapter II was written by Professor Alan Waterhouse. This chapter deals with the nature of architectural and engineering practice in Ontario, including a definition of the concept of design, the roles of engineering and architectural professionals, the roles of paraprofessionals, the role of the public in the design process, and evaluation of several aspects of current Ontario practice. This chapter specifically looks at the specialties developed in these practices, who performs various specialized functions, and the relationship of training to these functions.

Chapter III is by Professor Donald Dewees. Economic markets are defined and calculations are made of the number of firms practising in various markets, their size distribution and their concentration. The behaviour of firms in selling services, establishing prices and other activities is explored. The factors that influence the quality of professional services are examined. This chapter specifically

looks at the specialized functions in architectural and engineering practice, the training needed for these functions, the performance of present institutional arrangements in supplying qualified personnel to the functions, and the use of paraprofessionals in practice.

Chapter IV is by Professor Stan Makuch. This chapter deals with the institutional framework of practice. It includes a review of the legislation and cases relating to the jurisdictional disputes between architects and engineers in Ontario. Legislative provisions from other Canadian provinces and from the United States are examined and compared with those in Ontario. The legal basis for establishing jurisdictional boundaries, and the legal problems with those boundaries are discussed and some conclusions drawn. It specifically considers the performance of existing institutional arrangements in ensuring an appropriate supply of qualified professionals.

C. INFORMATION SOURCES

This study has generated five major new sources of date for analysis. These sources include:

1. firm questionnaire;
2. firm interviews;
3. a client survey;
4. a survey of municipal planning officers; and
5. case studies of two specific projects.

These are described briefly below.

1. Firm Questionnaire

The questionnaire presented in Appendix A of this report was mailed to the entire population of engineering and architectural firms in Ontario in May of 1977. Five-hundred and nineteen forms were distributed to architects and 1313 to engineers. Complete responses from 1107 firms were received and analysed in this study.

An immediate problem was to classify the responding firms as architectural, engineering, mixed or other. The classification adopted was based both on the professional identification of the owners of the firm and of the staff in 1977. A firm was defined as an architectural firm if it had one or more architects on staff, no engineers on staff, and included no engineers among the owners of the firm. A parallel definition was adopted for an engineering firm: this was a firm that had one or more engineers on staff, no architects on staff, and no architects as owners of the firm. A firm was classified as "mixed" if its staff included one or more architects and one or more engineers or if its ownership included architects and engineers. If a firm did not fit any of the above definitions it was classified as "other".

Some firm questionnaires may have been sent to firms that are not of interest to this study because they offer few or no services to the public. An example would be a construction or manufacturing firm that employs a few engineers for in-house work but whose staff are overwhelmingly engaged in non-engineering activities. Another example would be a firm that includes an engineer, but whose work includes no professional engineering services at all.

To remove such firms from our sample, we excluded firms with all three of the following characteristics:

1. a ratio of total staff to professional staff greater than 10:1;
2. the non-professional staff described as "other" rather than paraprofessionals; and
3. ownership of 50% or more of the firm by "others".

Seven firms failed to pass this test and were eliminated, all of them with other characteristics suggesting that they were not offering significant engineering services to the public.

Table 1 shows the number of firms of each type in our data sample. Since "other" firms form less than 1% of the sample, and represent a variety of quite different operations, they have been omitted from most of the analysis.

The firm questionnaire has provided quantifiable data on firm location, size, ownership, and manpower characteristics, the extent and nature of professional services offered, claimed expertise and functional divisions in building design, types of fees and attitudes toward collective bargaining. It is apparent that the respondents experienced little difficulty with the questionnaire, although a few questions received significantly lower response rates than others. In the analysis, we have generally indicated the number of firms responding to a particular question when that question is analyzed.

2. Firm Interviews

Personal interviews were conducted with senior professionals (principals), juniors (employed professionals) and paraprofessionals on a wide range of topics. The interview guidelines for the senior professional, for example, included the following sections: identification, characteristics of the firm, responsibilities within the firm, associations with other firms, clients, fees, regional factors, education and registration, professional organizations, and controls on the work of the professional.

TABLE I.1

Number of Firms Responding to the Survey by Type

Type	Number	Per cent of Sample
Architectural	303	27.4
Engineering	699	63.1
Mixed	96	8.7
Other	9	0.8
Total	1107	100.0

Source: Firm Questionnaire I.4(c) and II.I(a)

The firms to be interviewed were selected by a stratified random sampling procedure from the OAA, APEO and CEO directories. The sample was stratified by location (in or outside of Metropolitan Toronto), size (sole practitioner or partnership), and type of service (building design specialty or highway engineering). Twenty-five architectural firms and thirty-one engineering firms were selected for interview. Letters were sent to principals in these firms explaining the purpose of the research and requesting their cooperation. For various reasons four architectural firms and six engineering firms were not available for interview. In consequence one large engineering firm and one large architectural firm were added to the sample so that finally the interviews conducted were with twenty-two architectural and twenty-five engineering firms.

The interviews with senior professionals typically lasted two and a half hours; those with the juniors, one and a half hours and those with paraprofessionals, one hour. The interviews appear to have been successful in obtaining a wide range of facts and opinions about practice, the structure of firms and other issues relevant to this study which could not have been obtained from the mailed questionnaires. Several issues not previously appreciated by the study team were brought up by the interviewees.

3. Client Survey

It was felt to be important that, in addition to talking to members of the professions, we learn something from the clients who are served by these professions. To this end, a list was compiled of clients who had recently purchased services in the area of building design. The purpose of the client survey was to discover the process by which clients seek professional consultants, the type of services sought, the level of client sophistication, and their attitudes toward and expectations of the consultants they have retained.

A questionnaire was designed and mailed to a small number of clients, followed by a telephone interview. The questionnaire was modified as a result of the experience in this test round, and then mailed to approximately 70 clients. Forty-nine complete responses were received and analyzed in the study. A copy of the questionnaire sent to the clients is attached as Appendix B.

It must be emphasized that the Survey of Clients is in no way a statistically representative survey. Unlike the Survey of Firms, it was impossible to compile a list of all purchasers of engineering and architectural services within any period of time from which a random sample could be selected. In fact, the client list was derived by several rather ad hoc procedures. Thus it enabled us to gather some information about clients and their dealings with professional firms, but statistical conclusions were difficult from this survey. It has, however, provided a substantial amount of qualitative information.

4. Survey of Municipalities

A survey was conducted of municipal building departments and municipal planning departments in order to determine the impact that these departments had on building design. In particular, the following issues were pursued:

1. From municipal building departments:
   - (a) the organization of the departments;
   - (b) municipal views on the source and quality of building design (by building types);
   - (c) the inspection and approval process;
   - (d) the administration of the Ontario Building Code provisions with respect to buildings over 6,000 square feet and all institutional and public assembly buildings.
2. From municipal planning departments:
   - (a) the effects of zoning by-laws, subdivision control, development control and urban design on building design;
   - (b) procedures for the implementation of development control;
   - (c) the extent of public intervention in building design.

Interviews were conducted with officials of eleven municipalities in Ontario.

5. Case Studies

Two case studies were undertaken to examine in detail the design process for two different buildings. One study examines the Metropolitan Toronto Library, the other the Brampton Correctional Centre. They review in considerable detail the jurisdiction of decision-making and division of functions between various actors in the building design and the construction process. An attempt was made to document the roles of the architects and engineers and to understand the impact of various influences on the design process.

The planning for the library spanned an eight-year period. Because of citizen and municipal pressures, the original design of the building was significantly altered. The planning for the Correctional Centre covered a shorter period and had little citizen or municipal input. Its design did not undergo significant alterations after commencement of the project.

For the Library Case Study the files of the Building and Site Committee of the Metro Toronto Library Board were examined. Interviews were conducted with the architect of the project, with a representative from the City of Toronto Planning Department and with other officials of the Metro Toronto Library Board, city planning departments, construction managers and engineers on the project. For the case study of the Brampton Correctional Centre, information was obtained from the design and construction interview meetings conducted for the project;

from a Planning Report of Giffels Associates Limited, as well as from interviews with architects and engineers involved in the project.

CHAPTER II

THE INTERFACE BETWEEN ARCHITECTURAL, ENGINEERING AND PARAPROFESSIONAL FUNCTIONS

A. Wat erhouse

A. THE NATURE OF THE ISSUES

At a general level, and insofar as this analysis is concerned with the rights to practise of all architects, engineers and their paraprofessionals, we will attempt to deal with the broad spectrum of practice in Ontario. However, while there are several issues in this realm that require attention, our concern in this chapter is with the nature of the relationships between the professional and paraprofessional groups we have been asked to examine. These relationships lie at the heart of what could be a major problem that seems now to afflict a hitherto amicable partnership between the groups we wish to describe, and therefore they merit especially careful scrutiny.

Several important questions must be posed before proceeding: How are we to describe the respective scope of practice of the groups concerned as they relate to each other? Do the boundaries of this scope overlap? If so, then to what extent? If a significant overlap occurs, is this a desirable or unavoidable circumstance, from the viewpoint of those affected by practice? If it exists, is this circumstance recent, and is it likely to become entrenched? What, in particular, are the likely economic consequences of ongoing changes in established inter-group

relationships and what would be the outcome of these changes <u>vis-à-vis</u> the respective current professional roles in the Ontario society?

It is conceded at the outset that these are ambitious questions to ask and, given the complicated nature of the issues we will deal with, by no means easy to answer. There are few precedents for a study such as this, and none that can be used prototypically. We can, at best, provide partial answers.

Our procedure has been to concentrate - although not exclusively so - upon the spheres of professional activity concerning the design and construction of buildings in Ontario. We have dealt with those most affected by this activity through the media of survey questionnaires and interviews. In doing so, several further operational questions have been posed that address the substance of this chapter. What, for instance, is the manpower composition of professional firms, and how has it changed over the recent past? What kinds of services do firms provide, and how diversified or specialized are they? We wish to know, for given manpower compositions, and client and building types, the volume of business each firm has generated. We have asked firms to describe the extent and nature of their professional expertise for various building design functions, in order to gain further insight into overlapping professional territories. They have described how these territories vary in practice with varying building size, and the part that architects, engineers and paraprofessionals play in the processes of building design and

construction supervision.

We have elicited corroborating facts and opinions on all these questions by interviews with a sample of individuals of diverse experience, responsibility and qualification in architectural and engineering firms. Their private and governmental clients were surveyed to discover various patterns of professional/client interaction and emerging patterns of services required. The effect on practice of increasing public intervention in building design, through new mechanisms such as the Ontario Building Code and Section 35a of the Ontario Planning Act was explored by questioning practitioners and municipalities across the Province. Finally, all of these factors are illustrated through the detailed examination and description of two recent building projects.

The findings, with respect to inter-professional relationships at least, cannot be resolved easily into clear guidelines for the new regulation of practice. As one might expect, the relationships vary substantially by geographic region, firm size and composition and with a host of other factors associated with individual preferred ways of operating a professional practice.

It is also apparent that engineering and architectural firms are now experiencing considerable volatility. The construction industry, always the most vulnerable of sectors, is undergoing a protracted economic recession, a situation which may have temporarily altered the nature of interprofessional and

inter-firm competition. There are, moreover, strong indications that other important characteristics of Ontario practice are in a state of evolution. Changes in the economy, technical innovation, the emergence of socio-political awareness of environmental and aesthetic concerns, the magnitude and complexity of building projects, all seem to be generating profound changes in architectural and engineering practices. It is as if we have observed this evolution in mid-stream, with some understanding of its direction, but not its final outcome. To petrify the process at this time by legislating for existing conditions might well disturb a shift towards a more complex and desirable state.

With this in mind, we have resorted to some of the insightful literature dealing with overviews of the groups concerned, in order to glean ideas about their likely future prospects. Again, we have searched primarily for material about inter-group relationships (although the literature <u>about</u> architectural and <u>about</u> engineering practice, both in Ontario and elsewhere, is extensive and we suggest that some of it be read).

Before presenting our empirical analysis, we will summarize some general conclusions based upon the literature just mentioned, and our interviews with architects, engineers and clients.

1. The nature of buildings (i.e. built systems) is such that no watertight distinctions can be drawn between the realms of architectural and engineering services; that these realms overlap and will continue to do so should be of critical concern to those responsible for regulating practice.
2. The scope of engineering practice as measured by the volume of business, and especially that of 'mixed' firms (i.e. with qualified engineers and architects on staff) is expanding in Ontario, while architectural practice is not. Our empirical data are not sufficient to test this proposition rigorously but they tend to show somewhat greater growth in engineering practice than in architecture.

3. In spite of some profound "cultural" differences, architects and engineers overwhelmingly acknowledge the indispensibility of each other in the building design process (although less so with respect to who shall supervise and coordinate this process). Indeed, relations between the professions remain reasonably amicable with no significant signs of counter-productive inter-professional conduct. This is also the case in jurisdictions other than Ontario, where we have uncovered no evidence that disputes about rights to practise have actually reached the

courts. We conclude that the court cases that have occurred in Ontario are exceptions to the generally benign regard that each profession has for the other.

4. While engineers might regard architects as indispensible, there exists a large client group, operating in the residential, commercial and industrial sectors which, for reasons that are not entirely clear, does not employ architects, at least as prime consultants on building projects. Again, this circumstance is supported by our empirical data. Some practitioners believe that this could imply repeated contravention of the spirit of the Architects Act (leaving aside for the moment disputes about the legal interpretation of the word "structure").

5. The role of paraprofessionals in building design varies significantly in Ontario from simple routine tasks, through the whole range of functions that characterize the design process, to that of "job captain" in some instances. This variety is especially apparent in engineering practice. It appears to be a function of individual competence and the particular nature of each firm, with formal education seeming to have little impact on the kind of work a paraprofessional is able to undertake. This might be evidence that the theoretical knowledge required to operate effectively in building

design still does not preclude the "apprenticeship" system common to professional education some years ago. Given this great variety of paraprofessional functions, it is difficult to imagine new legislation that could effectively delimit rights to practise.

We repeat our conclusion that, with respect to the design of buildings, the practice of architecture and of certain classes of engineers are inextricably bound together. The laws and institutions that control and affect such practice should naturally be based upon the acknowledgement of these circumstances.

Inevitably the increasing complexity of building systems has produced - indeed is still producing - specialized professional functions within the design process. Inevitably certain conflicts over professional territory have arisen, and have been exacerbated no doubt by the volatility of the construction sector of our economy. It is apparent to us, however, that this conflict is minimal in Ontario, as it has been in other jurisdictions, and should not be overemphasized to the extent that radical legal and institutional changes are undertaken. The great majority of practitioners in Ontario are sensitive to, and seem to respect, professional boundaries such as they are. Moreover, the various mechanisms that control practice, whether legal, institutional, ethical or market-based, are sufficiently efficacious to ensure a high degree of inter-professional co-operation that serves well the interests of all concerned - professionals, clients and the general public. We have uncovered

no evidence which shows that the various professional bodies - the APEO, OAA, CEO - or their members - are primarily expansionist. or self-serving, although these organizations clearly have the interests of their members at heart over questions of protection.

Inevitably, the organizations regard self-regulation as being the best way to serve the public interest; certainly it would be difficult to show that this interest has been significantly impaired by the manner in which current practice is regulated, or even by the disputes, such as they are, between architects and engineers. On the other hand, the practice of architecture and engineering is not just the business of clients and consultants. Buildings, irrespective of their ownership or location are not private edifices so that for a variety of reasons their design has long been subject to systems of public scrutiny and control throughout Ontario. The network of public regulation, composed of the Ontario Building Code, zoning bylaws, development control and so on, acts in complementary fashion to the professional organizations and their statutes. A survey of this network shows it to be sufficiently adaptive to changing circumstance to reassure us that the two-fold system of control - professional and public - is working as well as can be expected.

B. THE CONCEPT OF DESIGN AND THE LIMITS OF LEGISLATION

There are several features of current and evolving practice related to building design which transcend those circumstances that are peculiar to Ontario, and which will

require discussion. There are few things, after all, about the tradition of practice in Ontario that distinguish it from practice elsewhere in North America. It might be useful then to describe the experience that is common to building design practice irrespective of location, to provide us with a framework to proceed upon.

Both architecture and engineering belong to what has been termed The Artificial Sciences.[1] That is, they are concerned with artefacts. Moreover, they can be distinguished from other sciences by their obligation to prescribe future states, as opposed to describing the nature of existing phenomena. In these two important senses, architecture and engineering are intimately linked together.

Furthermore, architects and engineers are agents of the process of design, which conceives ideas for, and describes prescribed artefacts and artefactual systems.[2] Still closer ties exist between architects and certain classes of engineers - namely those structural, mechanical and electrical engineers who are involved in the process of building design. It is thus apparent that the business of these two professions is bound at several levels - in their prescriptive, and essentially creative orientation; in their concern for man-made objects; by their use of a common prescriptive process, and, for many, through their involvement with buildings. Yet in spite of the strength of these commonalities, the relationships between architects and engineers do display variety from place to place, a variety that seems

to have emerged from historical factors that are peculiar to local circumstances. At one extreme, it used to be claimed - and still is in some quarters - that engineering represents the "science" of building, while architecture represents the "art".[3]

It has also been claimed that, for buildings to be successful, both art and science must be employed in complementary fashion in their conception;[4] in other words, that all buildings are characterized both by elements whose performance may be predicted by empirical means, and by elements which must be determined largely intuitively. Few practitioners would today agree that this actually characterizes the roles of professions, yet in a sense this dichotomization explains the emergence of the two overlapping professional "cultures" of architecture and engineering. The cultures are distinguishable by their distinctive value orientation, by differences in the skill and knowledge that each applies to professional activity, which in turn is reflected in the content of curricula in the schools. To a significant extent, nevertheless, these attributes are shared, so that joint professional institutions have been formed in places. Yet an institutional separation of the cultures of practice tends, by and large, to predominate in the English-speaking world. In Europe, on the other hand, they are less distinct, in the sense that architectural education and practice tend to emphasize the technology of building, and are thus more closely aligned with the culture of engineering. Seen in this light, the terms "art" and "science" no longer make sense as

distinguishable professional emphases in building design. Clearly both professions employ science, know-how and imagination in day-to-day practice.

It might then be asked whether with so much in common, it might not be possible to develop a fully integrated science of building design which the professions could then share as a means to achieve functional and, perhaps, institutional integration. There have, indeed, been periods of significant convergence, such as occurred with the advent of functionalism in design and, more recently, during the mutual attempt in the 1960's to make transparent the whole design process through algorithmic and other mathematical analyses. These attempts, however, were largely frustrated, so that at bottom, and in spite of (or perhaps because of) significant advances in building technology and further evolution in architectural method, the universal wish to synthesize the process of building design through the use of theories common to both fields has failed. The search on the part of both architects and engineers still continues, but as one observer recently noted:

> "As a science, design ... methodology is still in a preparadigmatic stage. Indeed the question may be asked whether in a world of continually and rapidly changing values any one theory of the process of design need survive beyond a few years."[5]

The absence of commonly-held theories and processes of design is a deterrent to complete mutual understanding and cooperation between the two professions. Moreover, this

circumstance introduces an important feature of the building design process itself that is pertinent to this study. The various sub-systems of all buildings interact with, and are affected by each other to a very significant degree. It is impossible to devise the heating, ventilating and electrical systems - even for a medium-sized building - without some knowledge of the structural system and the allocation of spaces for human activity. All of these systems in turn affect - indeed define - the appearance of the building.[6] Given this state of affairs, the need for theories and a methodology that synthesizes the currently disparate procedures undertaken by architects and various classes of engineers appears to be important to the effective design of buildings. In their absence professions must resort to know-how and negotiation, so in this sense the current state of practice is not ideal - no more so in Ontario than elsewhere. With this in mind, we now attempt to deal at a more specific level with the building design process.

1. Professional Roles in the Building Design Process

It is useful for our purpose to apply an adaptation of the Rusch typology of building systems to the problems discussed above. We can imagine all buildings being characterized by four sets of interactive features, namely:

1. Systems to ensure human safety and support desirable physiological states. These have been termed

"physical control" systems by Norberg-Schulz,[7] and include the structural, heating, ventilating, plumbing, mechanical and electrical systems of buildings.

2. Systems to accommodate human activities. Accommodation systems, of course, apply to the pattern of rooms, assembly areas and circulation channels, (i.e. corridors, staircases, elevators). They are located and shaped according to various complex criteria, including the need to minimize aggregate travel through the building and to maintain adequate privacy and quietude.

3. Building Envelope. Certain elements of all buildings fall within the category of enclosure and detail. They include the internal and external non-load bearing walls, claddings, finishes and fittings.

4. Signification (Aesthetics). We hesitate to use the term aesthetics to encompass the whole important and elusive area of the meaning of designed environments. There exist many levels of meaning in the experience of buildings, other than aesthetic, all of which should, ideally, be taken into account by the designer.[8]

In principle, the assignment of professional roles within such a framework appears straightforward - i.e., engineers

can "hold themselves out" as the designers of (1) and architects can be responsible for (2) and (3) and (4). There are, however, several complicating circumstances:

a. Contemporary building technology and design ideology make the design of each set of factors highly dependent on the other three.[9]

b. Many architects can, with justification, claim adequate knowledge to design some of the physical control systems, especially in smaller buildings. Conversely, there are structural engineers who possess a highly sophisticated aesthetic sense and other engineers with the mathematical facility (which many architects do not possess) to devise and operate computerized space allocation processes.[10]

c. There are now no universally-accepted canons of building and environmental aesthetics to which architects can lay claim as being the unique arbiters. It has thus become frequent for client groups to turn elsewhere for advice about building appearance. (See Section II.C. below.)

d. The complicated nature of design and construction procedures demands a management and coordinating function. For this reason, the organization of

building production is usually hierarchical. What, then, should be the professional affiliation of the coordinator?

e. The building design process is inescapably cyclic, rather than sequential, in the sense that a design decision about one system can be affected by subsequent decisions about another system. This calls for the closest inter-professional liaison and mutual understanding between all parties.

f. Increasingly, and especially in larger or special-purpose projects, professionals other than architects and engineers play important roles in the design and construction management process. These groups include acoustical and environmental impact experts, economists, computer scientists, market survey analysts, city planners and so on.

g. There has occurred a pronounced increase in governmental and non-client citizen involvement in building design over the past few years. This shift has been reflected for instance in changes to the Ontario _Planning Act_ and the introduction of the Ontario _Building Code_ which permit municipalities to implement procedures that allow a far greater degree of public

intervention than hitherto.

The pattern that is thus emerging in Ontario as elsewhere is one in which the straightforward relationships and responsibilities between practitioners and between client and practitioner, upon which professional institutionalization was based, have become obscured. Large, well-established clients such as commercial developers and government agencies at all levels have become knowledgeable about the scope of practice and the economics of building. Indeed many of them employ their own professional staff, not only for purposes of liaison with consultants, but to fulfill the complete range of professional services for their employers.

One can only speculate about the outcome of these important shifts that are now occurring in the world of building. In this sense any attempt made now to sharpen the boundaries of professional activity would be badly timed. There are, however, ways of looking after the public interest other than assigning professional functions to particular groups, and this issue needs to be examined.

2. Public Interest and Public Involvement in the Design Process

It has long been established that the public has a legitimate interest in the design of all buildings. This interest has increased and is reflected in the proliferation of legislation that is now imposed on the design process in Ontario and elsewhere. The evolving pattern of public interest is pertinent to this

study because the nature of architectural and engineering practice and, indeed, the division of professional functions are deeply affected by it. An examination of the rationale behind public involvement, and of the likely future circumstances that will impinge on this rationale, are, therefore, necessary.

There are three bases to this rationale:[11]

1. <u>To ensure human health and safety</u>. The Ontario <u>Building Code</u>, which is now superceding the various municipal codes, specifies and standardizes minimum structural and environmental control systems. It also specifies fire protection measures, noise and heat insulation, standards of finishes to roofs and floors, levels of illumination and measures to ensure quality control during construction.

2. <u>To minimize negative externalities</u>. The concept of externalities is one (of several) ways of legitimizing urban planning controls. Persons other than clients and occupants are affected by building design in ways that now require public control. Linked to this concept is the circumstance whereby building occupants utilize public infrastructure such as roads, transit, utilities, schools, parks and so on. The public imposition of zoning by-laws, and more recently,

development control procedures affect building use, bulk, appearance and population. The Ontario Planning Act and municipal plans, zoning bylaws and capital works are the chief instruments of this control. These procedures tend to stipulate certain features of buildings in the public interest. Others attempt to do this through negotiation, by making provision for density bonusing incentives and citizen participation committees to work with professional designers.[12]

3. To protect the interests of non-owner occupants. The economics of building dictate that non-occupant clients tend frequently to minimize investment in the non-revenue generating elements of buildings. This means that, for example, in the case of an apartment building, there may be a tendency to minimize the size and quality of corridors, lobbies, elevators, escape staircases, etc. relative to the size and quality of the apartments. Similarly, the land in itself generates no revenue, which leads to an almost universal tendency to maximize investment in the building (by maximizing densities) relative to land cost. Public regulation of these practices to protect the interest of non-client occupants usually takes the form of building codes and, for certain

purposes, zoning by-laws and development control procedures.[13]

In effect, there are instances, for example in the Borough of Scarborough, where almost all design decisions are now subject to public regulation. The impact on practice, particularly those aspects that are concerned with approvals, has been profound.[14] The physical control systems of buildings have always been subject to fairly stringent non-negotiable regulation so that engineers have, by and large, taken evolving government restriction in their stride. The architectural profession, however, sees it as a mixed blessing. There are some who believe that such regulation is essential to protect the public, not so much from potential malpractice, but from self-serving clients. Others are seriously concerned about infringement of the professional decision-making process, which sometimes places architects in the sensitive position of having to criticize the work of their peers. (When architects are appointed to membership on municipal review boards.)

On the other hand, the phenomenon of sustained public involvement in design suggests a shifting composition of the client group. To date, with very few exceptions in Ontario, clients and the public have been placed in an adversary position,[15] a position that has tended to compromise the designer's stance *vis-à-vis* the public interest. There are instances where public and client decisions about development are symbiotic, but the rationale for public intervention makes such instances exceptional.

It is at this point that architectural and engineering practice touch upon wide-ranging issues concerning the rights of citizens to determine the form of their own environment, and the shifts occurring in societal values in this respect are bound to modify the roles of professionals who now design environments.[16] One interpretation of this circumstance is to see each design process encompassing, and indeed serving, not one but several clients, who most frequently argue for conflicting objectives.[17] Seen in this light, the procedures and economics of practice and, indeed, the economics of the construction industry, could be transformed.

In periods of rapid urbanization and development, the costs and delays inherent in such a state of affairs probably would be unpalatable to all parties. However, the emergence of populist concern for designed environments has coincided almost everywhere with a pronounced loss of momentum in the urban development sphere. While the current economic trough will not be sustained, only the most optimistic of entrepreneurs would predict a return to the halcyon days of the fifties and sixties. One very plausible scenario, then, might be characterized by a design process that is extensive, transparent, completely open to public scrutiny and whose objectives are concerned with a balance between private facilities and externalities.[18] The spirit of such a process would be to emphasize agreement at the expense of transaction

expediency where processing speed no longer would be a first priority. The costs of such a process could be considerable relative to present costs, not only for design services but for extended carrying charges on land (which, however, are usually adjusted downwards during periods of slow growth).

Three related issues, then, are important to us: the first is concerned with the way in which architectural and engineering practice would be transformed; the second concerns shifts in demand for practitioners and special kinds of expertise under conditions of fewer new buildings but possibly more expensive professional services. The third and most important issue concerns the degree to which professional institutionalization can be replaced by or complemented by public intervention and regulation.

The highly technical and relatively "value-free" nature of engineering practice tends to discourage direct public intervention in the design of physical control systems in buildings.[19] On the other hand, the experience to date of instances where the public has initiated participation shows that matters related to building density, land use, space allocation and aesthetics predominate.[20] If this pattern continues, then it is architectural practice that will be most affected. The concept of externalities, therefore, and the skills necessary for their negotiation and design, may well emerge as important aspects of future architectural practice. In this sense, architecture and city planning, or that area of

planning which deals with the public policy of urban design, could become more closely aligned.[21]

In no sense does this scenario imply that the engineer will be excluded from this vital part of the design process. The most stringent limitations on designed environments are those imposed by physical control systems, so that the "realms of feasibility" for negotiated design may well be determined largely by engineers.

The engineer's already substantial place in building design, therefore, remains assured and may be expanded. Two possible interpretations of the nature of future architectural roles need consideration. On the one hand, the notion of the architect as negotiator in dealing with externalities suggests an expanded function for his profession, given that these transactions may well be complex and could affect most aspects of the architect's traditional sphere of activity. A second, less palatable possibility is one whereby the architect's role degenerates to that of peacemaker between client and public. There are no doubt other equally plausible scenarios, but while they all suggest a change in the role of both professions, it is the architect who will more likely need to change the essence of his profession.

The nature of inter-professional relationships in Ontario today is therefore complicated and volatile. Public intervention has attempted to adapt to this ongoing change by regulating the <u>process</u> of building design, which appears to us

to be the appropriate arena for regulation. We must again therefore question the propriety, or the necessity for a more precise legal delimitation of the boundaries of professional activity within this process than now exists. To substantiate this point, we will now need to discuss the specifics of inter-professional practice in Ontario.

C. THE BOUNDARIES OF PROFESSIONAL SCOPE IN ONTARIO

We have asserted above that the interdependencies between the subsystems of buildings are such that professional territories are bound to overlap. Our purpose at this point is to describe the extent to which the roles of architects and engineers - particularly structural, mechanical and electrical engineers - are not only complementary, but also possibly competitive. It follows that if building subsystems are interdependent, then <u>some</u> knowledge of most of these systems is a prerequisite for the competent practitioner irrespective of his professional designation. Thus to claim <u>some</u> expertise in areas beyond the particular subsystem being designed would not be unusual. In effect, this overlapping of expertise has been recognized and accepted by building professionals in Ontario for some time so that in some cases - the design of structural and environmental control systems of small buildings by architects, or of industrial buildings by engineers, for instance - the apparent crossing of professional boundaries is considered to be a legitimate enterprise.

But is "trans-professional" work confined to this legitimate realm in Ontario? Our survey of firms has attempted to answer this question. Clearly there is no straightforward terminology to describe the complexity of professional functions which can be applied to the kind of research instrument employed. We have attempted, nevertheless, to devise several measures of the scope of professional activity, each designed to provide information about "trans-professional work". These are:

1. The professional designation of firm owners, associates and employees.

   We can then classify firms according to manpower: firms can be solely architectural, solely engineering (with various subcategories) or mixed (i.e. with at least one member of the engineering and architectural professions as owners, associates or employees). Manpower composition is one indicator of the predominant orientation of the services a firm offers, or wishes to offer. Composition, where mixed, however, does not imply that both architectural and engineering services as such are offered.

2. The type and degree of professional expertise claimed by each firm.

   We have devised a typology (Table II.C.8) of building subsystems, components and design/management functions and then elicited the degree of expertise claimed by firms in each. There are, of course, difficulties in developing such a typology and interpreting the responses, given that

not all categories can be mutually exclusive. The design of enclosures (roofs, walls) is an especially complex process which can involve architects and several classes of engineers. Moreover the category design of external appearance reflects only in a rudimentary sense the pervasiveness of the process whereby decisions affecting building aesthetics are made.

3. The type of service actually provided, by building size, in the last three years.

   The typology has been applied to a question which asks each firm to indicate the category of services provided according to three sizes of building, namely: less than 6000 sq.ft.; 6000-15000 sq.ft.; and buildings over 15000 sq.ft.

4. The volume of business undertaken by each firm, by building type and client type.

   Firms were asked to indicate the total construction cost of projects completed between January 1, 1974 and January 1, 1977 for which they offered services as prime consultant. These entries were itemized by the type of building (e.g. institutional, office commercial) and the type of client (e.g. real estate development companies, government).

The analysis dealt exclusively with those firms which had indicated that their work was predominantly concerned with buildings.

1. Manpower Composition of Firms

Chapter III deals extensively with architectural and engineering practice in terms of its organization as an industry. To this end, issues of firm composition, concentration, regional distribution and certain aspects of behaviour are discussed there. Our purpose at this point is to analyse only patterns of manpower relationships between professions.

Table II.C.1 shows the distribution of firms sampled by type. For the moment, all engineering firms are included in a single category. Mixed firms are those whose manpower includes at least one architect and one engineer, each of whom may be registered, non-registered or probationary. The percentage distribution is fairly representative of the population of architectural and engineering firms in Ontario (there are over 500 architectural and 1500 engineering firms in total, which include the mixed firms in our sample), although no data exist which describe all mixed firms.

The regional distribution of those firms surveyed is contained in Table II.C.2. Again, this distribution approximates that of the population of architectural and engineering firms.[22] Of the architectural and mixed firms, 60 per cent of each are located within Metropolitan Toronto, and most of the remainder in the larger urban centres of Ontario. While the data suggest that a significantly lower percentage (42.4) of engineering firms locate outside Metro, it is important to bear in mind that these firms have a

TABLE II.C.1

Distribution of Firm Types[a]

Firm Type	Absolute Frequency	%
Architectural	303	27
Engineering	699	63
Mixed	96	9
Other[b]	9	1

(n=1107)

a Architectural Firms have membership in the OAA, Engineering Firms have membership in the APEO and Mixed Firms have membership in at least one, but have a mixed manpower composition (see Table II.C.3)

b Unclassifiable

Source: Firm Questionnaire I.4

TABLE II.C.2

Location of Firms, Percentage Distribution

	Architectural	Engineering	Mixed
Eastern Ontario	9.5	13.0	5.6
Central Ontario	15.3	26.5	15.7
Metro	63.4	42.4	59.6
S.W. Ontario	7.8	13.9	14.6
Northern Ontario	4.1	4.0	4.5
n=	283	699	87

Source: Firm Questionnaire III.1

greater tendency to locate beyond the municipal boundaries of Metro than do architecture firms, while still being encompassed within the urban region of Metro.

With respect to these two characteristics at least - percentage distribution by firm type, and regional distribution - then, the data are of an adequate quality to make reasonable assertions about the population as a whole.

The data used to classify firms as architectural, engineering, or mixed are presented in Table II.C.3, which contains the average firm manpower designations by level of seniority. It is apparent that the mixed firms, apart from being by far the largest are primarily engineering firms, with civil engineers tending to predominate. The average mixed firm has about four to five times more civil engineers than architects, more than twice the number of mechanical engineers, and roughly the same number of electrical engineers. In all three firm types professionals, paraprofessionals and others (administrative-clerical) occupy all ranks of seniority, although there is a more significant tendency for this kind of occupational mobility to occur in engineering and mixed firms. The average mixed firm in particular, in absolute terms and relative to its size, employs the largest number of para-professional and other staff.

Another description of the manpower in each type of firm for 1977 is shown in Table II.C.4. In architectural firms, the non-registered architects and probationary

TABLE II.C.3

Average Manpower Designations by Firm Type and Seniority

Designations	Architecture Sr. Arch/Eng.	Jr. Arch/Eng.	Non-Reg. Arch/Eng.	Proba-tionary Arch/Eng.	Para	Engineering Sr. Arch/Eng.	Jr. Arch/Eng.	Non-Reg. Arch/Eng.	Proba-tionary Arch/Eng.	Para	Mixed Sr. Arch/Eng.	Jr. Arch/Eng.	Non-Reg. Arch/Eng.	Proba-tionary Arch/Eng.	Para
1. civil engineer	0.2	0.1	0.0	0.1	0.0	1.1	0.4	0.1	0.1	0.3	4.5	1.8	0.6	0.3	1.3
2. architect	1.5	0.2	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.0	1.4	0.5	0.7	0.2	0.7
3. mech.eng.	0.0	0.0	0.0	0.0	-	0.8	0.2	0.0	0.0	0.8	2.5	0.6	0.4	0.6	1.3
4. eng. tech.	0.0	-	0.0	-	0.0	0.0	0.0	0.0	-	1.2	0.1	0.1	-	-	3.3
5. elect.eng.	-	-	-	-	-	0.4	0.3	0.1	0.0	0.2	1.2	0.4	0.1	0.0	1.2
6. draftsman	0.0	0.0	0.0	0.0	0.3	0.0	-	0.0	-	0.5	-	0.0	-	-	5.1
7. arch.tech.	-	-	0.0	0.0	0.2	-	-	-	-	0.0	0.0	0.1	0.0	-	0.3
8. chemical eng.	-	-	-	-	-	0.2	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.2
9. metallurgist	-	-	-	-	-	0.2	0.0	-	-	0.0	0.1	0.1	-	0.0	0.3
10. bldg.tech.	0.0	0.0	0.0	-	0.8	0.0	0.0	0.0	-	0.1	0.1	0.0	0.0	0.0	0.5
11. mining eng.	-	-	-	-	-	0.1	0.0	0.0	-	0.0	0.2	0.0	-	-	0.4
12. other	0.2	0.0	0.1	0.0	0.4	0.7	0.2	0.1	0.1	1.8	2.7	0.7	0.1	0.5	9.0
n=		(251)					(650, 651)					(89)			

* Est(Minus Max)

Note: a dash (-) in all tables means no observations.

Source: Firm Questionnaire II.2

TABLE II.C.4

Average Manpower Composition by Seniority, 1977

Manpower Classification	Architectural	Engineering	Mixed
Senior & Junior Architects	2.0	0.0	2.1
Senior & Junior Engineers	0.0	4.1	15.3
Non-registered Architects	0.5	0.0	0.9
Non-registered Engineers	0.0	0.3	0.9
Probationary Architects	0.4	0.0	0.3
Probationary Engineers	0.0	0.2	1.0
Paraprofessionals	1.8	4.5	24.6
Other	1.0	3.7	14.2

Source: Firm Questionnaire II.2

architects together average 0.9 per firm, or half the number of paraprofessionals. In engineering firms, on the other hand, the non-registered engineers and probationary engineers together average 0.5 per firm, which is a small fraction of the number of paraprofessionals. Mixed firms average one or less non-registered and probationary architects and engineers per firm, whose total is again a small fraction of the paraprofessional staff. Thus only the architectural firms use a significant proportion of non-registered and probationary professionals.

Table II.C.5 indicates average professional and average total manpower trends by firm type, for the years 1973 to 1977. This time frame witnessed a marked economic recession in Ontario, particularly evident in the construction industry, with only a slight tendency towards alleviation beginning in 1974. This recession is reflected in the professional and total manpower data for architectural firms in the Province. The average number of professional staff in these firms has risen only very slightly since 1974, following a low of 2.5 in 1973. Total staff members, however, while increasing to 1976, have since declined to a 1977 low of 5.7 (less than the 1974 figure). Perhaps surprisingly, however, engineering and especially mixed firms have experienced a vigorous and consistent growth, both in professional and in total manpower, since 1973. Thus, while in 1973 the average engineering firm was less than twice as large, and mixed firms

TABLE II.C.5

Average Manpower by Firm Type, 1973-1977

A. Professional Manpower

	Architectural		Engineering		Mixed	
	Average	s.d.	Average	s.d.	Average	s.d.
1973	2.5	3.9	3.2	7.6	13.1	42.0
1974	2.7	4.3	4.1	11.1	15.5	43.8
1975	2.8	4.4	4.0	9.0	17.4	45.6
1976	2.9	3.9	4.3	9.2	18.6	43.9
1977	2.9	3.4	4.6	9.6	19.9	42.9

B. Total Manpower

1973	5.5	11.1	9.0	22.0	40.4	128.3
1974	5.8	11.5	10.9	26.0	48.0	136.9
1975	6.1	11.1	11.6	27.7	56.1	158.9
1976	6.5	14.9	12.5	27.6	58.5	148.6
1977	5.7	7.9	12.8	27.7	59.1	129.1
	(n=296)		(n=687)		(n=94)	

Source: Firm Questionnaire II.1(a)

seven times as large as architectural firms, by 1977 this ratio had shifted to roughly 1:2.3:10.4 for architectural, engineering and mixed firms respectively.

It is apparent from these tables that the average architectural firm employs fewer non-professional staff relative to professional staff than do other firm types, and that the decline in size, moreover, has been largely at the expense of the non-professionals. In 1973, architectural firms employed at a professional: non-professional ratio of 1:2.2, while in 1977 this ratio fell to 1:1.9. Engineering and mixed firms have tended to employ more non-professionals than have architectural firms in the ratio of 1:2.8 (for engineering firms in 1973) to 1:3.0 (for mixed firms in 1977). These ratios have remained more-or-less unchanged since 1973 for both firm types.

The lower ratio for architectural firms seems to be a function of the special nature of architectural practice, in which more professional supervision of non-professionals at all stages of building design and a more continuous direct involvement of professionals throughout occurs.[23] The data suggest that the professional: non-professional ratio is not significantly affected by firm size (viz. the similarity in the ratios of engineering and mixed firms, in spite of a substantial difference in average size).

It is difficult to trace the source of the disparity in growth rates between architectural firms and other firms.[24]

Not all engineering and mixed firm activities are affected by the construction sector, of course, but most of them are (see Table II.C.7). It is remotely possible that the non-architectural firms were more severely depleted by the economic circumstances of 1973, and are simply growing to their pre-recession size, but this seems unlikely. The location of clients might, of course, play a role in this pattern. Table II.C.6 shows the geographic distribution of clients by firm type, weighted by an index of firm size. It is apparent that the architectural firms deal with less than half as many non-Ontario clients as the engineers, and about a third as many as the mixed firms. These ratios remain constant both for Canadian work outside Ontario, and for international work (including U.S.A.). However, non-Ontario clients for architects, engineers and mixed firms constitute only 9.2 per cent, 25.7 per cent and 27.7 per cent respectively of each total. Even taking into account the probable larger size of non-Ontario contracts, given the global nature of the economic recession it is difficult to attribute much of the disparity in firm growth to client location. On the other hand <u>some</u> disparity might be traced to this source and some to the possibly more buoyant economic sectors that do not affect building activity, yet partially support the functions of engineering and mixed firms. Unfortunately we have no data to substantiate such assertions.

There may, of course, be a further explanation

TABLE II.C.6

Geographic Distribution of Clients, weighted by firm SIZE[a]

	Architectural	Engineering	Mixed
Local	22.4%	16.4	7.5
Toronto	44.5	26.6	23.4
Ontario	23.9	31.2	41.4
Canada (exc. Ont.)	6.1	16.2	13.6
U.S.A.	1.1	3.7	8.2
International (exc. U.S.A.)	2.0	5.8	5.9
	n= (295)	(667)	(89)

[a]SIZE = total manpower + 1/2 professional manpower

Source: Firm Questionnaire III.1

TABLE II.C.7

Average % Gross billings, by type of service, 1974-1977

Field of Activity	ARCH.	ENG.	MIXED
Agriculture, fisheries, forestry, forest products	0.6%	3.28%	0.89%
Air and sea ports, harbours and terminals, coastal works	0.81	2.0	5.02
Bridges, tunnels, highways and railways	0.15	7.96	8.90
Buildings	88.09	25.29	21.35
Dams, irrigation and flood control	0.21	1.95	4.24
Plant process design	0.29	9.09	7.97
Mining and metallurgy	0.08	6.29	11.48
Municipal services (incl. sanitary engineering)	0.21	15.40	12.32
Petroleum and natural gas	0	4.23	2.6
Power generation, transmission and distribution	0	7.25	9.79
Telecommunications	0.80	3.22	1.90
Urban and regional planning	4.58	3.63	8.55
Other 1 = transportation	0.31	1.31	1.56
Other 2 = consulting	0	0.44	1.06
Other 3 = land dev'l	0	0.44	0
Other 4 = new design	1.84	1.18	0.10
Other 5 = other	2.76	7.12	3.19
n =	(270)	(645)	(89)

Source: Firm Questionnaire III.3

which raises some delicate questions. A significant part of the hitherto professional activity of architectural firms might increasingly be performed by other types of firms, especially mixed firms, which employ architects and have experienced the most rapid and consistent growth rate since 1973. Table II.C.3 shows that the average architectural firm contained 2.6 architects, while mixed firms averaged 3.5 architects. About a third of the architects surveyed work in mixed firms (311 from a total of 964), which with recent expansion suggests that such firms are performing an increasingly significant proportion of the total available architectural work.

These are important issues, and to explore them further we must turn our attention to those firms - of all types - which practise predominantly in the realm of building design. To this end we have used the information shown in Table II.C.7, which contain the average gross billings in percentage terms by type of service offered over the past three years. As might be expected, almost 90% of the services provided by architectural firms is devoted to buildings, with the next highest services - urban and regional planning - generating only 4.58 per cent of gross billings. One quarter of all engineering services and almost a quarter of the services offered by mixed firms are in building design, with the remainder for both types being mostly distributed in areas affected by the construction sector, such as municipal services, highways, bridges, power generation and urban and regional

planning. Moreover, when considering only those firms which are predominantly active in the building field, we discover that their 1973-1977 growth rates, measured by professional and total staff size, do not differ significantly from those of the whole sample.

There are, of course, methods of measuring firm size and growth rate other than by manpower composition; however, our analyses show them to be less reliable in this context.[25] On the other hand, the data presented above may be interpreted in several ways, and considered alone they provide no definitive clues about changing trans-professional relationships. We must turn elsewhere for evidence to illuminate this issue.

2. Areas of Expertise

As we stated above, professional practice in building design requires that each firm, if not each professional, should have some knowledge of building systems or functions beyond those that are central to the designated activity of the firm. It might be possible, therefore, to lay claim to sufficient broadly-based expertise to enable an ostensibly specialized firm to seek contracts outside its field of specialization. We have no wish to overstress the legitimacy of this kind of activity, although again, legitimate areas of trans-professional work are considered to exist.[26] Nevertheless, the unavoidable - indeed desirable - presence of broadly-based expertise makes difficult the sharp definition of professional territories. In these

circumstances the degree of expertise in particular fields, and not just the presence of expertise, becomes important.

There is, of course, no operational method of measuring the degree of expertise in any objective way. We have asked firms, therefore, to rank their claimed expertise by field, on the assumption that the claims will bear some relationship to the kind of work actually sought and carried out.

We have already suggested that the description of fields is not an easy task, and we readily concede that the field typology derived from our descriptions is a rudimentary one. The typology is shown in Table II.C.8.

We would expect certain classes of engineers to claim the highest expertise in the fields listed under A (with the possible exception of 5. Design of Enclosures, which is frequently inter-professional work). Fields listed in B, for the great majority of buildings, and under C for most buildings could be considered as architectural work. The two management functions are listed separately under D.

Firms specializing in building design were asked to rank their expertise on a scale of 1 to 4, with 1 representing considerable expertise and 4 representing none. The condensed results are contained in Table II.C.9.[27] It is clear that the fields claimed by architects and engineers are far from being mutually exclusive, as firms of all types claim significant expertise in all the fields listed. Not surprisingly,

TABLE II.C.8

Typology of Areas of Expertise in Building Design

A. 1. Design of Structural Systems

   2. Design of Heating, Ventilation, Air Conditioning Systems

   3. Design of Plumbing Systems

   4. Design of Electrical Systems (Inc. comm. and Alum.)

   5. Design of Enclosures (e.g. walls, roofs)

   6. Design of People Movement Systems

   7. Design of Acoustical Systems

B. 1. Design of External Appearance

   2. Design of Interiors

   3. Design of Furniture and Furnishings

   4. Design of Landscapes

C. 1. Building Space Layout

   2. Site Planning

D. 1. Project Management

   2. Construction Management

TABLE II.C.9

Degree of Expertise Claimed by Field-Percentage of Firms by Type

FIRM TYPE

Field	ARCHITECTURAL Significant*	Little*	ENGINEERING Significant	Little	MIXED Significant	Little
Struct.	25.6	74.3	51.3	48.7	68.4	31.6
Heating	7.2	92.8	36.9	63.1	46.1	53.9
Plumbing	14.8	85.2	37.2	62.8	46.0	54.0
Elect.	12.9	87.1	35.5	64.5	46.1	53.9
Encl.	90.6	9.4	44.9	55.1	77.6	22.4
Extern.	97.7	2.3	24.9	75.2	80.3	19.7
Intern.	96.6	3.4	16.6	83.5	72.4	27.6
Landsc.	69.1	31.0	11.3	85.5	52.7	47.4
Layout	97.8	2.3	40.8	59.2	89.5	10.5
Site	96.2	3.8	48.9	51.1	84.2	15.7
Proj. M.	62.7	37.4	54.6	45.5	77.6	22.4
Const. M.	47.0	53.0	51.9	48.1	63.1	36.9
	n=265 or 264		n=339		n=76	

*significant = 1+2
little = 3+4

Source: Firm Questionnaire IV.2

over 90 per cent of architectural firms claim to have significant expertise in External Appearance, Interior Design, Building Layout and Site Planning. The Design of Enclosures (90.6 per cent) and Design of Landscapes (69.1 per cent) also score highly. Because the engineering firms in our sample would mostly fall into specialized classes we would not expect claims of this magnitude in any field, so that in the "traditional" areas of engineering less than 40 per cent of engineering firms claim significant expertise (excluding the two management functions); the one exception is structural systems design, in which 51.3 per cent of firms claim significant expertise.

Our particular interest, however, lies with those firms which claim significant expertise in the "trans-professional" fields. We see that most of these fields are far from being the exclusive domain of a single profession. One-quarter of the architectural sample claims significant expertise in structural systems design, while the same proportion of engineers claims significant expertise in the design of external appearance. Almost half the engineering firms claim significant expertise in the design of enclosures, building layout and site planning. We have shown that mixed firms comprise architects and structural, mechanical and electrical engineers, so we would expect them to offer services across the whole spectrum of building design fields. This expectation is, indeed, reflected in the large numbers of mixed firms claiming expertise in all fields. With the exception of the design of electrical heating

and plumbing systems (46.1 per cent) every field is claimed by at least half of the mixed firms. Although these firms are dominated numerically by engineers (Table II.C.3), an anomaly exists in that more of them claim significant expertise in the architectural fields than in engineering. Thus the scores for enclosures, external appearance, interiors, landscape design, building layout and site planning are 77.6 per cent, 80.3 per cent, 72.4 per cent, 52.7 per cent, 89.5 per cent and 84.2 per cent respectively (as opposed to 68.4 per cent for structural systems design, for example).

In the fields of project and construction management, about half of the architectural and half the engineering firms claim significant expertise. Mixed firms score the highest in each, with 77.6 per cent and 63.1 per cent for project management and construction management respectively. The picture that thus emerges is one that suggests significant potential for inter-professional competition, although a more benign interpretation might see this overlapping of expertise as being directed partly towards <u>complementary</u> activities. It is also possible, of course, that firms may be conversant with one or two fields outside their domain and yet not have (i.e. claim) sufficient expertise in the critical mass of fields necessary to have the potential of seeking work outside their own designation in an effective way. We wish to know, therefore, the extent to which individual firms of all three types claim competence in <u>clusters</u> of fields. Table II.C.9

does not provide this kind of information.

We have therefore constructed three matrices of correlation coefficients which measure the degree of contingency between fields. They are shown in Tables II.C.10, II.C.11 and II.C.12. The tables utilize the robust full ordinal scale (1 to 4) and are therefore based upon more refined data than contained in II.C.9.

Table II.C.10 shows the matrix for architectural firms. The highest negative coefficient is -.10 (between external appearance and plumbing systems), so the matrix suggests a general pattern of fairly broadly-based expertise in architectural firms. Again, while the correlations between "traditional" architectural fields are of course significant (the one anomalous exception being .13 between site planning and external appearance), none is really strong, which tends to suggest that architectural practice is not, generally, based upon small clusters of related specialized services.[28]

Two other patterns are worth noting; the highest correlations occur between the group of "traditional" engineering fields - heating, plumbing and electrical systems design. This implies that, given the relatively small numbers of firms claiming expertise in these fields, most architectural firms see this whole cluster as largely unknown territory.[29] On the other hand, those firms which claim expertise in landscape design - and Table C.II.9 reveals significant numbers of them - also tend to be familiar with the engineering fields,

TABLE II. C.10

Architectural Firms-Correlation Coefficients Between Fields of Expertise[a]

	Struct.	Heat.	Plumb.	Elec.	Encl.	Exter.	Inter.	Lands.	Layout	Site	Project
Heating	.42										
Plumbing	.52	.66									
Elect.	.42	.51	.58								
Encl.	.23	.10	.23	.02							
Extern.	.10	-.10	.09	.11	.32						
Intern.	.20	.04	.16	.19	.22	.43					
Landsc.	.24	.25	.25	.26	.11	.16	.37				
Layout	.10	-.04	.07	.14	.41	.47	.28	.12			
Site	.17	.03	.10	.12	.23	.13	.25	.23	.52		
Project M.	.19	.24	.12	.05	.02	-.07	.12	.29	-.03	.10	
Constr. M.	.20	.25	.15	.09	.18	.16	.22	.27	.16	.19	.64

a In these analyses, the ordinal scale is now treated as an interval scale. Comparison with binary conversion results suggest that the ordinal scale is robust.

n = 264

Source: Firm Questionnaire IV.2

including structural engineering, and with project and construction management.

The engineering matrix in Table II.C.11 contains stronger positive and negative coefficients than II.C.10, which, as expected, indicates more extensive specialization than is to be found in architectural practice. In terms of clusters of expertise, firms appear to fall into three categories. Those who are familiar with heating, plumbing and electrical systems do not claim significant knowledge of the architectural fields. Thus the correlations between these fields and external appearance are -.06, .06 and -.05 respectively; for enclosures the correlations are -.15, -.02 and -.15; for layout they are .06, .14 and .06, and so on. Conversely, given the close ties which link electrical and mechanical engineers, high correlations (.84, .65, .54) do exist between the heating, plumbing and electrical fields.

The second group - clearly a substantial proportion of civil engineers with extensive expertise in the design of structural systems - appears to claim greater knowledge of the architectural fields than it does of electrical and mechanical systems. Not surprisingly, (if we assume that fairly extensive knowledge of structures is required for the design of enclosures), a high correlation (.70) exists between these two fields. External appearance, interior design, building layout and site planning are highly correlated with each other and, only to a slightly lesser extent, with

TABLE II.C.11

Engineering Firms-Correlation Coefficients Between Fields of Expertise

	Struct.	Heat.	Plumb.	Elec.	Encl.	Extern.	Inter.	Lands.	Layout	Site	Project
Heating	-.33										
Plumbing	-.24	.84									
Elect.	-.31	.65	.54								
Encl.	.70	-.15	-.02	-.15							
Extern.	.44	-.06	.06	-.05	.58						
Intern.	.28	.04	.11	.05	.43	.79					
Lands.	.22	-.04	.06	-.00	.32	.53	.52				
Layout	.41	.06	.14	.06	.58	.64	.61	.41			
Site	.37	-.06	.06	-.06	.52	.56	.48	.49	.74		
Project M.	.22	.10	.15	.09	.37	.42	.40	.26	.54	.51	
Constr. M.	.24	.03	.10	.05	.41	.41	.42	.26	.50	.46	.83

n = 338

Source: Firm Questionnaire IV.2

structural systems. Moreover, they correlate highly with project management and construction management. On the other hand the relationships between structural systems and the two management fields are not strong (.22 and .24).

This pattern seems to reveal two kinds of civil engineering firm: those who, apart from their own designated field, have significant knowledge of architectural and management functions; and those who deal exclusively with the more traditional civil engineering functions. The electrical and mechanical engineers appear to share an extensively linked base of expertise, but tend not to claim substantial knowledge of architectural or management functions.

The matrix for mixed firms is shown in Table II.C.12. The general pattern does not differ markedly from that of the engineering firms, which again demonstrates the predominant engineering orientation of mixed firms.

There appears in this table an anomalous series of negative coefficients between architectural functions and the heating and electrical fields. All firms in the mixed category include, of course, at least one architect, so one would expect the predominantly electrical and mechanical mixed firms to claim greater architectural expertise than those in the engineering group. The opposite pattern emerges however (although, as we have seen, the claim to architectural expertise among such firms in the engineering group is not extensive).

TABLE II. C.12

Mixed Firms-Correlation Coefficient Between Fields of Expertise

	Struct.	Heat.	Plumb.	Elec.	Encl.	Exter.	Inter.	Lands.	Layout	Site	Project
Heating	.14										
Plumbing	.25	.90									
Elect.	.29	.72	.68								
Encl.	.49	.16	.29	.01							
Extern.	.40	-.11	.05	-.19	.60						
Intern.	.37	-.07	.06	-.15	.61	.81					
Landsc.	.10	-.00	.11	-.14	.13	.47	.31				
Layout	.21	-.08	.08	-.12	.36	.58	.54	.52			
Site	.21	.00	.14	-.17	.46	.58	.55	.53	.75		
Project M.	.19	.26	.29	.21	.11	.13	.21	.26	.04	.26	
Constr. M.	.35	.33	.37	.31	.22	.09	.14	.05	-.10	.09	.68

n = 76

Source: Firm Questionnaire IV.2

On the other hand, the correlations <u>between</u> the various architectural fields remain strong and between these fields and structural systems design they remain quite strong, which suggests two kinds of mixed firms - those which are <u>predominantly</u> mechanical and electrical and which, while employing architects, do not choose to claim significant knowledge of architectural work <u>as a firm</u>. The second type is primarily civil engineering oriented and <u>does</u> claim architectural knowledge.

In summary, it is possible to detect a shared claim to a significant part of the professional territory of architects and of civil engineers. This overlap seems to be characterized by an extensive knowledge of structural systems claimed by about one-quarter of the architectural firms, and significant knowledge of the cluster of architectural functions (excluding landscape design) claimed by about the same proportion of engineers, most of whom are probably civil engineers. Mixed firms, particularly those with a predominant civil engineering orientation seem to claim <u>as a group</u> significant expertise in architectural design. Mixed firms, architectural firms and civil engineering firms claim significant expertise in project and construction management.

On the other hand, the professional territory of mechanical and electrical engineering appears to be closely bound, with little claim on the part of the practitioners to extensive knowledge outside their own fields, although

each appears to be intimately linked to the other.

3. The Nature of Building Design Services

The picture of building design practice that now emerges is one that could be interpreted as possessing considerable potential for trans-professional competition; architectural firms appear to be stabilizing in size and growing in numbers, and many possess extensive knowledge of structural engineering; engineering firms and mixed firms are expanding vigorously, and significant numbers of both types claim to have expertise in architectural matters. All three types have large numbers of firms which are familiar with project management and construction management. The mixed firms in particular are large, multi-professional, and experiencing the most rapid expansion in manpower.

So far we have not examined evidence which reveals that the energies of the three types of firms are significantly directed towards competitive activities. Claims of expertise and manpower data might well be interpreted as characterizing firm types that are still to some degree complementary in nature. We have drawn attention to the acknowledged existence of legitimate areas of trans-professional work, and these must now be examined to determine the actual divisional pattern of functions. These are best analyzed by exploring the nature and extent of the work on which firms have actually been engaged.

To this end, we have asked Ontario firms to report on the functions they have performed recently in designing buildings of various sizes and types. As we mentioned above, trans-professional work on small buildings is considered to be a legitimate undertaking in Ontario, and it is also acknowledged by most architects that engineers can legitimately design buildings that are of a substantially industrial nature. The pattern of such work will now be explored.

Table II.C.13 is a condensation of the data dealing with building size. Firms were asked to report the type of services they have performed over the past four years for three categories of building size: those less than 6000 sq.ft.; between 6000 and 15000 sq.ft.; and over 15000 sq.ft. The types of service were those listed in the typology of fields of expertise. As expected, substantial numbers of all firm types perform services in each area for small buildings (less than 6000 sq.ft.). With the exception of landscape design (15.4 per cent of engineering firms) construction management (21.0 per cent of architectural firms), project management (21.4 per cent of architectural firms) and interior design (20.0 per cent of engineering firms), more than one-quarter of all firm types participated in each area of small building design. Mixed firms in particular were active in both architectural and engineering fields, with an average of well over half of such firms having provided the full spectrum of

TABLE II.C.13

Service Provided by Building Size 1974-1977
Percentage of Firms by Type

FIRM TYPE / BUILDING SIZE IN SQUARE FEET / FIELD	Architectural		Engineering		Mixed	
	<6000	>15000	<6000	>15000	<6000	>15000
Struct.	43.7	14.8	44.7	41.9	54.7	65.3
Heating	24.1	5.7	38.7	31.5	41.3	45.4
Plumbing	31.7	6.5	36.2	29.1	44.0	44.0
Elect.	29.5	6.5	32.7	31.2	38.7	34.7
Encl.	59.3	61.6	36.6	29.4	62.6	73.3
Extern.	72.5	79.4	27.9	19.1	66.7	66.6
Intern.	68.8	59.7	20.0	10.6	65.3	50.6
Landsc.	52.4	49.4	15.4	9.7	45.3	49.4
Layout	68.0	74.6	31.4	27.1	62.6	75.9
Site	62.3	75.6	33.9	31.4	61.3	84.0
Project M.	21.4	21.4	27.4	28.9	32.0	49.3
Constr. M.	21.0	18.4	28.3	26.2	25.4	41.3
	n=261 or 262		n=320 or 321		n=75	

Source: Firm Questionnaire IV.3

design services.

Almost half of the architectural firms designed structural systems for small buildings (about the same proportion of engineers), almost one-quarter designed heating systems and about one-third designed plumbing and electrical systems for this building category. Conversely, one-third of all engineering firms worked on building layouts and site planning, 27.9 per cent on external appearance and 36.6 per cent on enclosures.

The least active group in management functions for small buildings were the architects, with only 21.4 per cent and 21.0 per cent reporting project and construction management services respectively. Mixed firms, on the other hand, reported a participation rate of 32.0 per cent and 25.9 per cent respectively. It might seem anomalous that by far the largest of firms - the mixed firms - should be the most active group in small building design. One explanation could be that it is perhaps to this kind of firm that large developers of family housing turn for professional services. Alternatively, of course, the pattern may simply be a function of large size, which implies more contracts of all kinds.

Mixed firms, however, also reported the highest average participation rate in the design of buildings over 15000 square feet. The lowest rate for these firms is 34.7 per cent, for the design of electrical systems and construction management; otherwise rates were all well over

40 per cent, with the highest scores in architectural services (73.3 per cent for enclosures, 66.6 per cent for external appearance, 75.9 per cent for building layout and 84.0 for site planning. These figures on average exceed the equivalent rates reported by architectural firms). Given the manpower composition of mixed firms, the predmominance of architectural services is surprising; nevertheless, this type also reported the highest participation rate in engineering services, with scores of 65.3 per cent, 45.4 per cent, 44.0 per cent and 34.7 per cent for structural, heating, plumbing and electrical design respectively. These universally high rates are, to an unknown extent, a function of the large size of mixed firms of course, as well as their multi-professional composition. We would expect the larger firms of any type to handle more contracts, with the subsequent probability that they are more likely to engage in work on more types and sizes of building. Nevertheless, the <u>distribution</u> of participation rates across services within firm types is our focus of interest, and it is clear that the mixed firms in Ontario have handled a very substantial amount of both architectural <u>and</u> engineering work over the past three years.

The separation of functions between architectural and engineering firms begins to emerge in the patterns of service for buildings over 15000 square feet. The specialized nature of mechanical and electrical engineering services in particular is revealed in the low participation of

architectural firms in heating, plumbing and electrical design (5.7 per cent, 6.5 per cent and 6.5 per cent respectively) in larger buildings. On the other hand, 14.8 of the architectural firms designed the structural systems for larger buildings, almost 30 per cent of the engineering firms designed layouts and almost 20 per cent designed the external appearance of large buildings. In fact the provision of the whole cluster of architectural services for large buildings by engineers is far from being insignificant, although interior design and landscape design (10.6 per cent and 9.7 per cent respectively) are not extensive functions of these firms.

Again, the relatively large size of engineering firms must be taken into account in assessing these patterns of practice, as must the types of buildings which each professional group designs. Before proceeding to these questions we are interested to know the extent to which claimed expertise is matched by the kinds of service actually performed. Are the architectural firms which claim significant expertise in structural design, for instance, the same firms that are successful in providing this kind of service? Alternatively, is significant claimed knowledge of architectural services among certain engineering firms related to the work they actually perform? Clearly, in answering these questions, the size of buildings designed must be taken into consideration.

Table II.C.14 contains conditional gammas (-1 to +1), which measure associations between the ordinal

TABLE II.C.14

Claimed Expertise by Service Performed
On Various Building Sizes, by Firm Type

FIRM TYPE

FIELD	Architectural	Engineering	Mixed
	Partial Gammas		
Structure	-0.70	-0.85	-0.72
Heating	-0.88	-0.88	-0.87
Plumbing	-0.80	-0.87	-0.87
Electrical	-0.78	-0.83	-0.81
Enclosures	-0.59	-0.82	-0.59
External	-0.33	-0.83	-0.78
Interior	-0.04	-0.87	-0.61
Landscape	-0.34	-0.88	-0.67
Layout	-0.61	-0.80	-0.69
Site	-0.36	-0.75	-0.57
Project M.	-0.70	-0.74	-0.68
Constr. M.	-0.68	-0.76	-0.76
	n=260	n=317	n=75

Source: Firm Questionnaire IV.2, IV.3

variables we are examining for each firm type. The gammas are based upon more refined data than are presented in Tables II.C.9 and II.C.13. Thus the expertise scale ranges from 1 1 to 4 and the services performed scale includes a zero services score and accumulations of building sizes within a range of 0 to 8. The existence of a high value positive gamma would indicate that significant numbers of firms claim expertise but have not provided the service on larger buildings or, of more concern, that they do not claim expertise but have actually provided the service. Conversely, a high value negative gamma would reveal that firms with no expertise have tended not to provide the service, or have provided it only on small buildings.

The table is partly reassuring in this respect. It contains no positive gammas and the negative gammas are consistently high for architectural and engineering firms in the trans-professional areas. This implies that few if any such firms transcend the boundaries of claimed expertise. The data for mixed firms are less easily interpreted because the extent of their multi-professional composition varies, but all the values are sufficiently high to alleviate possible concern about these firms operating in areas beyond their claimed competence.

We realize that Table II.C.14 does not remove all doubts about professional transgressions. For a firm to claim expertise does not mean that it possesses expertise.

Again, a less charitable interpretation of Table II.C.14 might reveal that there are instances where the very provision of a particular service has caused firms to believe they are justified in claiming expertise by having accumulated the experience. To discover this would require a far more detailed study than we have been able to conduct.

4. Building Types, Client Types and the Volume of Business

This part of the analysis depends to a considerable extent on financial data gleaned from the survey of firms. Unfortunately, as with many surveys of this kind, it is not possible to be completely confident about the accuracy of these data (see Chapter III). Nevertheless, because we will not be dealing with fees at this point, but with the value of construction projects, and because these data are, to a reasonable extent, consistent with data employed elsewhere, they are assumed to be of sufficient quality to give a fairly accurate picture of the distribution of business across practices in Ontario. Because this kind of information is important, we present it in detail.

So far we have revealed that Ontario building design practice - at least with respect to our sample - is characterized by two significant groups of factors. The first is the disparity in growth patterns between architectural firms on the one hand, which have grown in numbers but stabilized in size over the past four or five years, and engineering

and mixed firms which have grown in number and size. This growth we have measured in manpower terms. Secondly, there exists a significant overlapping of functions between firm types, with respect to claimed expertise and building size. None of this information establishes the extent to which firm types are in active competition or to which architectural firms have been losing marginal increases in business to other types of firms since 1973.

We now need to ask about the extent to which the markets for the kinds of professional services offered by the three firm types are separate. To what extent, in other words, has a client been able to turn to more than one type of firm for a particular kind of advice about building design? To answer this question we turn our attention towards <u>building types</u> which are the product, after all, of particular kinds of design services. Because most larger buildings are the product of <u>both</u> engineering and architectural services, however, to ask firms to list the building types on which they have worked without specifying the kind of service offered would be insufficient for our purpose. On the other hand, to elicit specification at the level of our field typology would be too cumbersome a task. We have thus limited our scope to the most important of professional services - that of <u>prime consultant</u>.

We have asked firms to report on client types for which they have acted as prime consultant within specified

categories of buildings. They were requested to report the total construction cost for buildings completed between 1974 and 1977 according to these classifications. Tables II.C.15, II.C.16 and II.C.17 contain these data for architectural, engineering and mixed firms respectively. The reported volume covered by all three types during the four-year period was just $11.98 billion,[30] of which the architects were responsible for 46.16 per cent, the engineers for 35.73 per cent and mixed firms for 18.11 per cent. The largest building component was made up of the three types of residential development, single family, low rise and other (i.e. medium and high rise) housing. Over one-third of the architectural and engineering volume, and almost one-third of the mixed firm volume were devoted to prime consultancy on residential buildings, although only architectural firms (11.0 per cent) were significantly active in single family housing.

The second largest component of the total volume (although the largest in terms of a single building type) varied between firm types. Institutional buildings accounted for 30.0 per cent of the architectural volume, office commercial buildings for 23.6 per cent and other residential for 26.1 per cent of the engineering volume. Industrial and office commercial buildings each account for 23.0 per cent of the mixed firm volume. In other words, over half of the prime consulting work of all firm types was devoted to two categories of buildings, and in the case of mixed firms, over

TABLE II.C.15

Total Volume of Construction by Building Type and Client Type
Buildings Completed 1974-1977. Architectural Firms as Prime
Consultants ($100,000's)

CLIENT TYPE

Building Type	Indust.& Comm.	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F.Resid.	96.0	529.1	10.9	140.1	5190.0	27.0	60.9	6054.0	11.0
Low Rise Resid.	287.0	3430.1	208.1	819.0	228.0	98.1	19.9	5090.2	9.2
Other Res.	185.1	5616.0	197.0	381.1	2028.0	55.9	22.0	8485.1	15.4
Institu- tional	224.9	33.9	8264.1	7609.1	209.1	151.9	5.0	16498.0	30.0
Office Comm	2972.0	6592.0	325.0	985.0	279.0	54.0	0.9	11207.9	20.3
Retail Comm	1263.0	1430.0	17.1	28.9	257.0	44.1	-	3040.1	5.5
Industrial	1765.0	488.0	5.9	257.0	156.9	131.1	-	2803.9	5.1
Other	479.9	23.0	651.0	745.0	175.0	9.0	7.1	2090.0	3.8
Total	7272.9	18142.1	9679.1	10965.2	8523.0	571.1	115.8	55269.2	
%Total	13.2	32.8	17.5	19.8	15.4	1.0	0.2		100.0

n=237

Source: Firm Questionnaire IV.1

TABLE II.C.16

Total Volume of Construction by Building Type and Client Type Buildings Completed 1974-1977. Engineering Firms as Prime Consultants ($100,000's)

BUILDING TYPE	CLIENT TYPE: Indust. & Comm.	Real Estate & Dev.	Non-Profit	Government	Individual	Arch/Eng Firm	Other	Total	% Total
S.F. Resid.	11.0	327.1	110.0	30.9	204.0	50.0	2.1	735.1	1.7
Low Rise Resid.	101.1	1042.9	55.0	1298.9	103.0	824.9	13.0	3438.8	8.0
Other Resid.	333.1	8262.0	50.0	498.0	930.9	1067.0	18.0	11159.0	26.1
Institu-tional	65.1	135.0	464.0	573.9	111.9	2241.9	13.0	3604.8	8.4
Office Comm	745.1	6383.1	5.0	926.1	209.0	1828.9	12.0	10109.2	23.6
Retail Comm	915.0	1265.1	13.0	135.0	387.9	1736.0	27.0	4479.0	10.5
Industrial	5125.9	652.9	15.0	215.9	98.0	1548.1	22.0	7677.8	18.0
Other	499.9	4.0	2.1	903.1	13.1	111.0	44.0	1577.2	3.7
TOTAL	7796.2	18072.1	714.1	4581.8	2057.8	9407.8	151.1	42780.9	
%Total	18.2	42.2	1.7	10.7	4.8	22.0	0.4		100.0

n=210

Source: Firm Questionnaire IV.1

TABLE II.C.17

Total Volume of Construction by Building Type and Client Type Buildings Completed 1974-1977. Mixed Firms as Prime Consultants ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	203.0	1294.0	-	30.0	87.0	110.0	6.0	1730.0	7.9
Low Rise Resid.	19.0	1696.0	213.0	419.0	49.0	300.0	80.0	2776.0	12.7
Other Resid	153.0	1534.0	145.0	191.0	172.0	310.0	8.0	2513.0	11.5
Institu-tional	80.0	15.0	818.0	1491.0	15.0	583.0	400.0	3402.0	9.5
Office Comm	1505.0	1878.0	15.0	396.0	126.0	1082.0	-	5002.0	23.0
Retail Comm	558.0	525.0	-	8.0	109.0	262.0	2.0	1464.0	6.7
Industrial	4445.0	112.0	60.0	227.0	97.0	80.0	-	5021.0	23.0
Other	33.0	70.0	118.0	524.0	63.0	402.0	82.0	1292.0	5.6
TOTAL	6996.0	7124.0	1369.0	3286.0	718.0	3129.0	578.0	23200.0	
%Total	32.1	32.4	6.3	8.9	3.3	14.4	2.7		100.0

n=69

Source: Firm Questionnaire IV.1

two-thirds of their total volume can be attributed to residential, commercial and industrial construction.

The largest single client group was real estate and development companies, contributing $4.33 billion to the total volume, and about one-third of the prime consultancy work of all firm types (32.8 per cent, 42.2 per cent and 32.4 per cent respectively). Industrial and commercial companies accounted for $2.2 billion, or 18.3 per cent of the total volume, and were, with real estate companies, the largest client group (32.1 per cent) to the mixed firms. All levels of government accounted for $1.75 billion of construction, or 14.61 per cent. One-fifth of the architectural volume (mostly in institutional buildings) is devoted to government work, whereas only 10.7% of the engineers' work and 8.9% of mixed firm work falls into this category.

Certain patterns are of special interest to us. Engineering firms were prime consultants on a greater volume of residential work for real estate and development companies, especially medium and high rise residential, than the architects ($963 million versus $957 million). The total value of medium and high rise residential construction supervised by the engineering sample well exceeds that for which the architectural firms were responsible ($1.1 billion versus $849 million). Similarly, the engineering firms completed $1.0 billion worth of office commercial buildings,

only slightly less than the $1.1 billion on which architects acted as prime consultants. Industrial work, as expected, comprised a significant part (18.0 per cent) of the engineering volume, although this category made up a larger share (23.0 per cent) of work supervised by mixed firms.

It is apparent that no single building category dominates the work of any firm type. In general all three are active as prime consultants for some of the same building and client types, especially in the residential and office commercial fields. Significant differences however do exist. Well over half of all government work is supervised by the architects, who also act as clients - presumably largely through sub-contracts to engineers - to a far greater extent than do engineering firms. Only 1.0 per cent of architectural work as prime consultants is done for other firms, whereas 22.0 per cent of the same kind of service performed by engineers is for other architectural or engineering firms. Mixed firms seem to concentrate most of their activity in multiple residential, office commercial and/or industrial development, doing relatively little single family and retail commercial design (7.9 per cent and 6.7 per cent respectively).

These figures do suggest that widespread competition for prime consultancies occurs between firm types. This appears to be particularly prevalent in the residential and commercial fields which together constitute well over half of the total construction volume handled by our sample.

All types seem to compete for residential work and the engineers and architects for commercial work. Both mixed firms and engineers are apparently in competition for industrial buildings. Apart from these major sectors there are smaller, but still significant, areas of common activity. The single exception appears to be buildings designed for non-profit groups, which fall almost exclusively into the architects' domain.

However, the client survey presented in Chapter III reveals that not all of this overlap may be competitive; that some clients wish to employ both architectural and engineering firms as joint prime consultants on some jobs. Nor does the presence of an architect or an engineer as prime consultant mean that he is necessarily doing the work of two professionals. On the other hand it is difficult to avoid the impression, given the nature of the previous data, that extensive inter-professional competition does in fact exist. We will return to this issue below.

Total construction costs give us a general picture of the proportional activity of firm types. There are substantial differences in firm numbers between types in our sample, however, so the data need adjusting to enable us to reveal relationships between firms of mean size within each type. We will then proceed to make further adjustments, given the great differences in firm size between types, to understand the relative activities based upon units of professional manpower.

Tables II.C.18, II.C.19 and II.C.20 contain the mean volume of construction per firm for architectural, engineering and mixed firms respectively. We see that the relationships between activities of the architectural and the engineering firm do not change very much. The mean architectural firm does slightly more residential work than the mean engineering firm ($8.3 million and $7.3 million respectively), but the architects predominate in low rise and the engineers in medium and high rise development. The engineering firm handles about the same volume of office commercial work but three times the amount of industrial work than the architectural firm; on the other hand the architectural firm supervised $4.0 million worth of non-profit contracts while the engineers handled $0.3 million.

Substantial differences from the total volume are revealed, however, when comparing the activities of the mixed firm with those of other types. The mixed firm completed $10 million worth of residential development btween 1974 and 1977 - far more than the amount completed by the architectural or the engineering firms. The largest single group - industrial buildings - accounts for $7.3 million, more than twice the volume completed by the engineers. The mixed firm predominates in government work, exceeding the architectural firm in this field in terms of volume. In consequence, the mixed firm supervised far more construction volume than either the architectural or the engineering firm

TABLE II.C. 18

Mean Volume of Construction per Firm by Building Type and Client Type Buildings Completed 1974-1977 Architectural Firms as Prime Consultants ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	0.41	2.24	0.05	0.59	22.09	0.11	0.26	25.75	11.0
Low Rise Resid.	1.21	14.47	0.88	3.47	0.96	0.41	0.08	21.48	9.2
Other Resid	0.78	23.70	0.83	1.61	8.59	0.24	0.09	35.84	15.4
Institu-tional	0.95	0.14	34.72	32.24	0.89	0.64	0.02	69.6	30.0
Office Comm	12.54	27.93	1.37	4.16	1.18	0.23	0.00	47.41	20.3
Retail Comm	5.33	6.06	0.07	0.12	1.09	0.19	-	12.86	5.5
Industrial	7.48	2.06	0.03	1.08	0.66	0.55	-	11.86	5.1
Other	2.03	0.10	2.75	3.17	0.74	0.04	0.03	8.86	3.8
TOTAL	30.73	76.7	40.7	46.44	36.2	2.41	0.48	233.66	
%Total	13.2	32.8	17.5	19.8	15.4	1.0	0.2		100.0

n=237

Source: Firm Questionnaire IV.1, II.1(a)

TABLE II.C. 19

Mean Volume of Construction Per Firm by Building Type and Client Type. Buildings Completed 1974-1977 Engineering Firms as Prime Consultants ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	0.05	1.57	0.52	0.15	0.98	0.24	0.01	3.52	1.7
Low Rise Resid.	0.48	4.99	0.26	6.22	0.49	3.95	0.06	16.45	8.0
Other Resid	1.59	39.53	0.24	2.38	4.43	5.11	0.09	53.37	26.1
Institu-tional	0.31	0.65	2.22	2.75	0.53	10.73	0.06	17.25	8.4
Office Comm	3.57	30.54	0.24	4.43	1.00	8.79	0.06	48.63	23.6
Retail Comm	4.38	6.05	0.06	0.65	1.86	8.35	0.13	21.48	10.5
Industrial	24.76	3.12	0.07	1.03	0.47	7.41	0.11	36.97	18.0
Other	2.39	0.02	0.01	4.32	0.06	0.53	0.21	7.54	3.7
TOTAL	37.53	86.47	3.62	21.93	9.82	45.11	0.73	205.21	
%Total	18.2	42.2	1.7	10.7	4.8	22.0	0.4		100.0

n=210

Source: Firm Questionnaire VI.II.1(a)

TABLE II.C. 20

Mean Volume of Construction per Firm by Building Type and Client Type. Buildings Completed 1974-1977 Mixed Firms as Prime Consultants ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	2.94	18.75	-	0.44	1.26	1.59	0.09	25.07	7.5
Low Rise Resid.	0.28	24.58	3.09	6.07	0.71	4.35	1.16	40.24	12.0
Other Resid	2.21	22.23	2.10	2.77	2.49	4.49	0.12	36.41	10.8
Institu-tional	1.16	0.22	11.86	21.61	0.22	8.45	5.80	49.32	14.7
Office Comm	21.81	27.22	0.22	5.74	1.83	15.68	-	72.5	21.5
Retail Comm	8.09	7.61	-	0.12	1.58	3.80	0.03	21.23	6.3
Industrial	64.42	1.62	0.87	3.29	1.41	1.16	-	72.77	21.6
Other	0.48	1.01	1.71	7.59	0.91	5.83	1.19	18.72	5.6
TOTAL	101.39	103.24	19.85	47.63	10.41	45.35	8.39	336.26	
%Total	30.1	30.7	5.9	14.2	3.1	13.5	2.5		100.0

n=69

Source: Firm Questionnaire IV.1, II.1(a)

($33.6 million, $23.4 million and $20.5 million respectively).

As we have seen, however, the sizes of firm types vary enormously, so we would expect the largest firms - the mixed firms - to handle the greatest volume of work. It should be stressed at this point that the data listed in the construction cost tables should not be equated with the total amount of work undertaken by firms, but only represent prime consultancy services. Unfortunately it has not been possible in this study to survey the total construction cost for each professional service offered by each firm - this would be a monumental task - so we must rely on the representative information we have gathered. We can assume, nevertheless, given the existence of dual prime consultants on some buildings (probably the larger buildings), that double entries constitute a significant part of Tables II.C.15, II.C.16 and II.C.17. On the other hand, the practice of sub-contracting professional services to other firms implies that a significant portion of work actually undertaken is not entered in these tables.

It is important to take this into account in discussing the content of Tables II.C.21, II.C.22 and II.C.23, which give the impression (but do not prove) that unit manpower production varies substantially between firm types. The tables contain prime consultancy construction costs undertaken per unit of professional manpower by firm type. We see that, for the four-year period under consideration, the

TABLE II.C. 21

Mean Volume of Construction per Professional by Building Type and Client Type. Buildings Completed 1974-1977. Architectural Firms as Prime Consultants ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	0.15	0.80	0.02	0.21	7.89	0.04	0.09	9.2	11.0
Low Rise Resid.	0.43	5.17	0.31	1.24	0.34	0.15	0.03	7.67	9.2
Other Resid	0.28	8.46	0.30	0.58	3.07	0.09	0.03	12.81	15.4
Institu-tional	0.34	0.05	12.4	11.51	3.18	0.23	0.01	27.72	30.0
Office Comm	4.48	9.98	0.49	1.49	0.42	0.08	0.00	16.94	20.3
Retail Comm	1.90	2.16	0.03	0.04	0.39	0.07	-	4.59	5.5
Industrial	2.67	0.74	0.01	0.39	0.24	0.20	-	4.25	5.1
Other	0.73	0.04	0.98	1.13	0.26	0.01	0.01	3.16	3.8
TOTAL	10.98	27.4	14.54	16.59	15.79	0.87	0.17	86.34	
%Total	13.2	32.8	17.5	19.8	15.4	1.0	0.2		100.0

n=237

Source: Firm Questionnaire IV.1, II.1(a)

TABLE II.C. 22

Mean Volume of Construction per Professional Building Type and Client Type. Buildings Completed 1974-1977. Engineering Firms as Prime Consultants ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	0.01	0.37	0.12	0.03	0.23	0.06	0.00	0.82	1.7
Low Rise Resid.	0.11	1.16	0.06	1.45	0.11	0.92	0.01	3.82	8.0
Other Resid	0.37	9.19	0.06	0.55	1.03	1.19	0.02	12.41	26.1
Institu-tional	0.07	0.15	0.52	0.64	0.12	2.50	0.01	4.01	8.4
Office Comm	0.83	7.10	0.06	1.03	0.23	2.04	0.01	11.3	23.6
Retail Comm	1.02	1.41	0.01	0.15	0.43	1.94	0.03	4.99	10.5
Industrial	5.76	0.73	0.02	0.24	0.11	1.72	0.03	8.61	16.0
Other	0.56	0.00	0.00	1.00	0.01	0.12	0.05	1.74	3.7
TOTAL	8.73	20.11	0.85	5.09	2.27	10.49	0.16	47.70	
%Total	18.2	42.2	1.7	10.7	4.8	22.0	0.4		100.0

n=210

Source: Firm Questionnaire IV.1, II.1(a)

TABLE II.C.23

Mean Volume of Construction per Professional by Building Type and Client Type. Buildings Completed 1974-1977. Mixed Firms as Prime Consultant ($100,000's)

CLIENT TYPE

BUILDING TYPE	Indust & Comm	Real Estate & Dev.	Non-Profit	Government	Individuals	Arch/Eng Firms	Other	Total	% Total
S.F. Resid.	0.16	1.05	-	0.02	0.07	0.09	0.01	1.40	7.9
Low Rise Resid.	0.02	1.37	0.17	0.34	0.04	0.24	0.06	2.24	12.7
Other Resid	0.12	1.24	0.12	0.15	0.14	0.25	0.01	2.03	11.5
Institutional	0.06	0.01	0.66	1.21	0.01	0.47	0.32	2.74	9.5
Office Comm	1.22	1.52	0.01	0.32	0.10	0.88	-	4.05	23.0
Retail Comm	0.45	0.43	-	0.01	0.09	0.21	0.00	1.19	6.7
Industrial	3.60	0.09	0.05	0.18	0.08	0.06	-	4.06	23.0
Other	0.03	0.06	0.10	0.42	0.05	0.33	0.07	1.06	5.6
TOTAL	5.66	5.77	1.11	2.65	0.58	2.53	0.47	18.77	
%Total	32.1	32.4	6.3	8.9	3.3	14.4	2.7		100.0

n=69

Source: Firm Questionnaire IV.1, II.1(a)

architectural professional handled $8.63 million of such work, while the engineering and the mixed firm professional undertook $4.77 million and $1.88 million respectively. From Tables II.C.4 and II.C.5 we have inferred that the professional-non-professional ratio for architectural firms is about 1:2, and just over 1:3 for engineering and mixed firms. This means that the differences in the amount of work per professional cannot be attributed to these ratios. We infer, then, that a greater amount of the architect's time - relative to the engineer's time - is spent on building prime consultancy, and that most of mixed firm practice is devoted to other kinds of work, some of which is sub-contractual in nature.[31]

The unit professional figures thus present rather a different picture from the total volume and firm volume data. The professional in mixed firms, moreover, supervises substantially less residential work than the architect or the engineer, and it is apparent that the architect is responsible for slightly more medium rise and high rise residential construction than is the average engineer. The predominance of the engineer in office commercial development also diminishes.

Tables II.C.15 to II.C.23, in addressing overall patterns, tell us nothing about the specializations of individual firms. But we now wish to know, in the light of this information, the extent to which architects, engineers

and mixed firms concentrate on particular building types. Correlation matrices were constructed, but none indicated that there was a significant tendency for any firm type to specialize around building types although, of course, individual specialized firms do exist.[32] Chapter III describes further analyses used to determine the extent of this and other types of specialization, but the picture that emerges is characterized by firms conducting broadly-based practices insofar as building types are concerned.

This is important information, because it suggests again, especially when reviewing the data on expertise and services performed on various sizes of building, that there are many firms of all types that are not building-type or service-specific in their functions.

5. Summary

Ideally, a study intent on finding answers to the questions posed at the beginning of this chapter would determine long-range and short-range trends in all services by all firms, and relate these trends to changing manpower size and composition by types of firms. In this way it would be possible to explore in depth shifts in the division of professional functions between architects and engineers in the building design process. We do not, of course, have this wealth of information, so we must resort to speculation to some extent in order to supplement the facts that are

available to us.

The facts substantiate, we feel, our initial assertion that the building design process is <u>not</u> composed of finitely divisible professional functions. Functional territories, indeed, merge and overlap to an extent that transcends straightforward inter-professional cooperation. Architectural firms perform "engineering" functions and engineering firms undertake "architectural" services; and this fact of professional life seems to occur extensively in - and is sanctioned by - most jurisdictions as being an inevitable and desirable state of affairs. The complicated nature of contemporary building design demands a great deal of trans-professional knowledge from the practitioners of building design, so a positive interpretation of the data presented in this chapter at least leads us to believe that this kind of knowledge is present to a remarkable degree. Seen in this light, any attempt to change the legal institutions in Ontario that have fostered inter-professional and trans-professional functions could only be counter-productive.

Our survey of clients shows that they are generally satisfied with the current framework of practice, and fully use the freedom to choose among a wide variety of practitioners. We assert, moreover, that if it is claimed that building technology and building design are substandard, then the fault does not lie with the current division of

professional functions, but elsewhere.

The suspicion might linger that the existing institutional framework of design has permitted engineering firms and mixed firms to grow at the expense of architectural firms. It is possible to interpret our data to support conclusion, although accurate data on the total volume of architectural and engineering practice over a substantial time period are not available.[33] Inter-professional competition does exist. Architectural firms have grown in number but not in size, while engineering and mixed firms have grown in both number and size. But these facts are only suggestive in the absence of positive evidence of the numbers of clients who are turning to engineering firms and to mixed firms for architectural services. Such evidence can only emerge from a study that is far more extensive than this. It would, moreover, be necessary to ask <u>why</u> this shift, assuming it exists, is occurring before hastening to legislate measures designed to protect architectural practice against competition. The crucial question would still need to be addressed: is the changing scope of architectural and engineering practice causally related to a possible deterioration in the design of environments? We have not actively addressed these issues because, important as they are, they remain largely impalpable. Our suspicion, nevertheless, is that the designed quality of the Ontario environment is not dependent on the relationship between the rights to practise of architects and engineers,

but on other, more broad-ranging factors.

D. DIVISION OF FUNCTIONS - PROFESSIONALS AND PARAPROFESSIONALS

1. Public and Professional Concerns

Having considered a number of relationships between architectural and engineering firms we now turn our attention to the relationships between certain members *within* these firms. Our particular interest is with the functions of the *paraprofessional* group *vis-à-vis* those of other firm members. We also wish to know how the functions of this group vary between firm types, and the extent to which they are able to take on professional roles under certain conditions.

In a sense, we need to examine this issue for reasons that are similar to those that lie behind our discussion of inter-professional relationships; that is, the absence of clear boundaries between various functional activities. Here, however, we must imagine these boundaries to be *horizontally* arrayed between persons operating within the same process. In this respect, problems associated with this issue are endemic to *all* architectural and engineering processes, and not solely to building design.[34]

To speak of this issue as problematic emphasizes only one aspect of a complex and fluid state of affairs; the paraprofessionals themselves, by and large, ascribe distinct advantages to a process which permits a substitution of personnel based upon experience and knowledge, rather than

credentials.[35] The question of credentials, moreover, is compounded by the recent initiation of degree and diploma programs in architectural and engineering technology.[36] Currently, the graduates of such programs are regarded (by professionals) as paraprofessional, and are thus classified with individuals who possess no post-secondary education.

This regard, whether justified or not, seems to place greater limits on the status and career potential of paraprofessionals than on their actual functions. A 1970 analysis of Ontario conditions states:

> "It was discovered that technologists are not regarded as career substitutes for engineers, and that there are distinct barriers to the upward mobility of technologists. Substitution does take place in work functions, where there is a functional reorganization of the engineer's activity."[37]

A prevalent view of post-secondary paraprofessional education is that it is characterized by a marked pragmatic and technical orientation, whereas university programs for both architects and engineers increasingly emphasize theory and conceptual material. Seen in this light, it is tempting to read complementarity between professional and paraprofessional functions. However, given the heterogeneous nature of design and production processes, together with the infinite variety of firm operating procedures, significant substitution does seem to occur. The study cited above continues:

> "The principal reasons for substitution appear to be changes in technology, rather than inefficiencies in manpower deployment or

> changes in relative wages and availability of technologists and engineers. Again, while engineers are required when a technology is first introduced, once it matures the engineers tend to be released in order to exploit new fields, while technologists move in to replace them."[38]

We suspect that this reason applies less to architectural processes, which are less affected by new technology, than to engineering design. Moreover, as we have pointed out above, the professional/paraprofessional ratio is much smaller in architectural firms, which suggests a lower incidence of substitution. We will return to this issue below.

While being cognizant of the interests of both professionals and paraprofessionals with respect to competition for income, status, responsibility and accountability, the question of <u>public</u> concerns seems paramount. In this regard, two issues need to be explored. First, how are the costs of production affected by substitution, if at all? This subject is developed in Chapter III, but the paraprofessional view, (as yet unchallenged, to our knowledge) is that substantial economies would accrue to a system that permitted liberal substitution.[39]

The second public concern pertains to the <u>quality</u> of production. Public safety must, of course, be guaranteed wherever substitution occurs. We have discussed above the now extensive role of public standards affecting health and safety in building design; where these regulations are unambiguous they may supplement, even replace, professional self-regulation.

Such standards, moreover, are equally comprehensive in all other engineering fields, to the extent that in 1972 the Canadian Council of Professional Engineers recommended that:

> "......the engineering profession study immediately, a revised relationship with technologists which would effectively delegate to them public responsibility for certain aspects of engineering activity where public safety is assured by the enforcement of codes, regulations or inspection."[40]

Architects might claim that much of their own field is not conducive to such regulation, and that para-professional roles must be limited. On the other hand, questions of public safety do not occur so frequently in architectural as in engineering practice. Nevertheless, this raises a further relevant aspect of production quality, which both architects and engineers regard as being supremely important, namely creativity.

There is no doubt that the creative ability to synthesize spatial and aesthetic configurations that are uniquely compatible with the design context figures - or should figure - largely in architectural practice.[41] Similarly, the Association of Professional Engineers of Ontario points out that:

> "......tasks may be assigned either to engineers or technologists if the work is routine or follows established procedures. However, if there is a creative element or complications in the job, then the work would be assigned to an engineer. The keys to assigning jobs appear to be complexity, creativity, design content, and union environment."[42]

The views of the APEO and the OAA in this

respect are unequivocal. That is, the Associations believe that unsupervised paraprofessionals should not be assigned functions that depart from routine. In other words, that:

> "The greatest difference perceived between engineers and technologists appears not to be in technical ability, but in their knowledge of and interest in other related areas. Engineers seem to bring a broader outlook on problems, and consider more options in their solutions."[43]

It is possible that the professional groups with which we are concerned - the OAA and the APEO might, in cooperation with their respective paraprofessional associations - the AATO and OACETT, define more liberal limits to unsupervised paraprofessional work where adequate public regulation exists. However, their case for maintaining some limits rests with the rather intractable but nevertheless important ability to be creative, to accept responsibility, and to manage. There are, to our knowledge, no <u>objective</u> analyses which address the claim that individuals without professional education somehow inherently lack these qualities. Such a claim, if interpreted literally, seems absurd, especially in view of the "professionally-oriented" education that some technologists apparently have. However, in the absence of sound empirical evidence this issue becomes difficult to resolve.

It is tempting to apply the logic of our conclusions respecting the need for "open" boundaries between architects and engineers - namely the interrelated nature of

practice and the existence of adequate public regulation - to this issue. But the professional/paraprofessional issue is differently structured, most importantly in the sense that it is difficult to perceive the advantages that would accrue to the public (as opposed to paraprofessionals themselves), by relaxing functional boundaries, unless one accepts the claim of lowered product costs.

Before exploring this question further we will need to examine certain aspects of current Ontario practice.

2. Professional/Paraprofessional Functions in Ontario

We must first attempt to describe what is meant by the term "paraprofessional". This is a difficult task, so that it has been accomplished to some extent by a process of elimination. To explain this we list the following classifications that we have adopted:

SENIOR ARCHITECT OR ENGINEER	An individual who has been licensed/ registered for more than five (5) years.
JUNIOR ARCHITECT OR ENGINEER	An individual who has been licensed/ registered for five (5) years or less.
PROBATIONARY ARCHITECT OR ENGINEER	A full-time employee who has completed the university training required for a professional designation and is within the professional organization's period of internship.
NON-REGISTERED ARCHITECT OR ENGINEER	An individual who has completed the university training required for a professional designation but who is not in a professional organization's internship program.
PARAPROFESSIONAL	An individual who does technical work but is not included in one of the above categories.

No doubt there will be disagreement with this definition; some might claim, for instance, that probationary and non-registered "professionals" are in fact paraprofessionals. Others would prefer a more positive description than the one we have adopted. There are also several classes of paraprofessionals whose existence may not be reflected in this description, such as draftsmen, building technicians and building technologists.[44] But this terminology is also loose and ill-defined, hence our decision to use the elimination process.

To determine the functions of firm members, including paraprofessionals, we have listed seventeen processes of building design, such as architectural, structural, acoustics, etc. and divided each process into six stages. These are:

1. Client consultation
2. Conceptual design
3. Detailed design
4. Drawings
5. Specifications
6. Supervision

The first four or five are roughly sequential stages and the first four are usually, but not always, delegated according to decreasing seniority. There are, of course, many exceptions, such as would occur in very small firms, or on small design contracts. <u>Supervision</u> includes supervision of professionals,

paraprofessionals or construction.

Firms were requested to specify the designations of their members for each design stage of the processes undertaken by the firm. The questions and the responses are contained in Tables II.D.1, II.D.2, II.D.3 and II.D.4. The data are presented in fairly detailed form to give some understanding of how patterns of design processes vary between firm types for all designations.

Our focus of interest here, however, is on the role of the paraprofessional within these processes, so we have extracted data on paraprofessional functions in four important areas, namely architectural, structural, mechanical and electrical design. The data are contained in Tables II.D.5 and II.D.6 for supervised and unsupervised paraprofessionals respectively.

Increasing numbers of firms of all types use supervised paraprofessionals as the design processes proceed from client consultation to drawings, so that supervised paraprofessionals are occupied at the drawings stage by most firms. About 23% to 43% of the engineering firms and 28% to 67% of the mixed firms use supervised paraprofessionals at this stage.

The great majority of supervised paraprofessionals are occupied at the detailed design, drawings and specification stages and in varying amounts at the supervision stage (presumably supervising other paraprofessionals). Mixed firms

TABLE II.D.1

Firm Survey Questionnaire - Functions within Design Processes

IV.4 This question seeks information on the types of individuals working in areas of **Building Design** within your firm. Complete the table below by entering letters in the cells corresponding to the following code:

Work Done By:

A	=	Engineer
B	=	Architect
C	=	Supervised engineering para-professional
D	=	Unsupervised engineering para-professional
E	=	Supervised architectural para-professional
F	=	Unsupervised architectural para-professional
G	=	Other

If the work is done by more than one category, enter the code letters of all categories doing the work.

For Example:

Site Planning	B	B	BDE	E	E	B

	Client Consultation	Conceptual Design	Detailed Design	Drawings	Specifications	Supervision
1. Impact and Feasibility Studies						
2. Architectural						
3. Structural						
4. Heating, Ventilation & Air Conditioning						
5. Plumbing						
6. Mechanical Other Than 4 & 5						
7. Communication						
8. Illumination						
9. Electrical other than 7 & 8						
10. Acoustics						
11. People Movement Systems						
12. Site Planning						
13. Landscape						
14. Furniture & Furnishings						
15. Other (please specify) ________						

TABLE II. D. 2

Functions within Design Processes - All Staff

ARCHITECTURAL FIRMS:

Percentage of Firms using manpower type by design stage

	CLIENT CONSULTATION	CONCEPTUAL DESIGN	DETAILED DESIGN	DRAWINGS	SPECIFICATIONS	SUPERVISION
1. Impact and Feasibility Studies	B=71 A=BE=5	B=65 BE=7	B=36 BE=16	B=19 E=18	B=37 BE=7	B=30 BE=11
2. Architectural	B=84 A=6	B=80 BE=7	B=46 BE=28	B=25 BE=26	B=59 BE=13	B=51 BE=24
3. Structural	B=25 AB=9	B=24 AB=9	B=10 A=9	B=7 BE=6	B=11 A=9	B=11 A=7
4. Heating, Ventilation & Air Conditioning	B=19 AB=9	B=17 AB=8	B=5 A=10	B=4 A=7	B=6 A=11	B=7 A=9
5. Plumbing	B=24 AB=8	B=19 AB=7	B=7 A=8	BE=E=5 A=6	B=8 A=11	B=8 A=9
6. Mechanical Other Than 4 & 5	B=12 AB=5	B=9 A=AB=4	A=6 G=B=AB=2	A=4 C=AC=B=2	B=4 A=7	B=4 A=6
7. Communication	B=16 AB=7	B=12 AB=6	A=5 AB=4	B=2 A=4	B=5 A=6	B=4 AB=3
8. Illumination	B=25 AB=8	B=21 AB=9	B=10 A=6	A=B=5 G=4	B=9 A=7	B=9 A=7
9. Electrical other than 7 & 8	B=13 AB=5	B=10 AB=5	B=4 A=7	G=E=AC=B= BE=2 A=5	B=4 A=8	B=AB=4 A=5
10. Acoustics	B=31 AB=4	B=28 A=4	B=15 BE=7	BE=9 B=8	B=17 BE=5	B=17 BE=6
11. People Movement Systems	B=35 BE=C=A=BG=1	B=33 BE=2	B=13 BE=11	BE=10 B=8	B=18 BE=5	B=15 BE=8
12. Site Planning	B=76 A=BE=4	B=71 BE=8	B=44 BE=19	B=24 E=BE=19	B=40 BE=10	B=37 BE=16
13. Landscape	B=61 A=BG=3	B=56 BE=6	B=32 BE=15	B=19 BE=16	B=33 BE=9	B=29 BE=14
14. Furniture & Furnishings	B=56 BE=BG=4	B=50 BE=BG=4	B=32 BE=12	B=20 BE=14	B=33 BE=8	B=33 BE=9
15. Other 1 - project management	B=3 -	B=2 -	B=2 G=BF=1	B=2 BF=1	B=2 G=1	B=BF=1 -
16. Other 2 - Interiors	B=1 GBF=1	B=1 -	B=1 -	B=1 -	B=1 -	GBF=1 -
17. Other 3	B=2 AB=1	B=2 -	B=2 -	B=1 -	B=1 -	B=2 -

N=257

Source: Firm Questionnaire IV.4

TABLE II. D. 3

Functions within Design Processes - All Staff

ENGINEERING FIRMS:

Percentage of Firms using manpower type by design stage

	CLIENT CONSULTATION	CONCEPTUAL DESIGN	DETAILED DESIGN	DRAWINGS	SPECIFICATIONS	SUPERVISION
1. Impact and Feasibility Studies	A=40 E=AC=AD=2	A=33 AC=AD=3	A=16 AC=8	C=13 D=8	A=21 AC=5	A=19 AC=7
2. Architectural	A=15 B=2	A=11 G=2	A=7 AC=3	E=C=G=A=3 F=D=CE=B=2	A=10 E=AC=2	A=11 AG=2
3. Structural	A=36 AD=3	A=30 AC=AD=5	A=18 AC=12	C=13 D=9	A=19 AC=10	A=20 AC=8
4. Heating, Ventilation & Air Conditioning	A=34 AD=3	A=25 AC=7	A=14 AC=11	C=12 D=8	A=17 AC=8	A=16 AC=8
5. Plumbing						
6. Mechanical Other Than 4 & 5	A=23 AD=3	A=20 AC=AD=3	A=11 AC=AD=6	C=7 D=6	A=14 AC=5	A=13 AC=5
7. Communication	A=17 AD=3	A=13 AC=4	A=AC=6 AD=4	C=6 D=4	A=7 AC=5	A=7 AC=4
8. Illumination	A=22 AC=AD=3	A=17 AC=5	A=10 AC=8	C=12 D=6	A=10 AC=8	A=12 AC=6
9. Electrical other than 7 & 8	A=26 AC=4	A=23 AC=AD=4	A=13 AC=7	C=13 D=6	A=14 AC=7	A=16 AC=5
10. Acoustics	A=11 G=AC=AD=E=1	A=9 E=G=AC=AD=1	A=6 AC=3	C=3 D=AC=2	A=4 C=AC=2	A=6 AC=2
11. People Movement Systems	A=6 G=E=AC=AD=1	A=6 E=G=AD=AG=1	A=4 AC=2	C=3 A=2	A=4 C=2	A=4 AD=AC=E=AB=AG=1
12. Site Planning	A=35 AC=AD=2	A=26 AC=4	A=16 AC=6	C=13 D=6	A=18 AC=5	A=18 AC=5
13. Landscape	A=14 AD=2	A=8 AC=3	A=5 AC=3	C=5 D=4	A=7 D=G=AC=AD=2	A=8 C=D=AC=AD=2
14. Furniture & Furnishings	A=3 G=2	E=G=2 E=F=A=AC= BE=1	G=2 F=E=C=A= AC=BE=1	G=2 E=F=C=D= A=AC=1	G=A=2 E=B=C=AF=1	G=A=2 E=1
15. Other 1 - Project management	A =1 -	A =1 -	A =1 -	A =1 -	- -	- -
16. Other 2 - Interiors	-	-	-	-	-	-
17. Other 3	A=4 -	A=2 C=AC=1	A=3 AC=1	C=A=2 AC=1	A=2 C=AF=AC=AG=1	A=2 E=C=AC=GAD=1

N=320

Source: Firm Questionnaire IV.4

TABLE II. D. 4

Functions within Design Processes - All Staff

MIXED FIRMS:

Percentage of Firms using manpower type by design stage

	CLIENT CONSULTATION	CONCEPTUAL DESIGN	DETAILED DESIGN	DRAWINGS	SPECIFICATIONS	SUPERVISION
1. Impact and Feasibility Studies	A=B=19 AB=31	B=21 AB=23	AB=11 B=9	BE=9 E=8	AB=19 B=12	A=12 AB=17
2. Architectural	B=48 AB=16	B=49 BE=AB=8	B=21 BE=20	BE=20 E=17	B=25 BE=AB=13	B=25 AB=11
3. Structural	A=41 AB=16	A=49 AB=9	A=27 AC=20	C=25 AC=9	A=29 AC=13	A=28 AB=AC=9
4. Heating, Ventilation & Air Conditioning	A=28 AB=11	A=31 B=AC=5	A=13 AC=15	C=21 D=7	A=12 AC=19	A=19 AC=11
5. Plumbing	A=25 AB=9	A=28 B=AC=5	A=11 AC=13	C=19 D=B=AC=5	A=9 AC=21	A=15 AC=11
6. Mechanical Other Than 4 & 5	A=24 AB=8	A=24 AC=7	AC=15 A=9	C=19 AC=5	A=11 AC=19	A=13 AC=12
7. Communication	A=16 AB=8	A=15 AB=5	A=8 AC=7	C=13 AC=4	A=8 AC=11	A=AC=8 D=AD=4
8. Illumination	A=23 AB=12	A=23 AB=11	A=11 C=AC=8	C=16 E=B=5	A=12 AC=13	A=13 AC=11
9. Electrical other than 7 & 8	A=24 AB=7	A=20 AB=AC=4	AC=11 A=9	C=15 A=AC=4	A=AC=12 AD=3	A=11 AC=12
10. Acoustics	B=15 AB=13	A=11 AB=12	A=AB=7 B=5	C=11 E=7	A=E=B=AC=5 AB=4	A=9 B=8
11. People Movement Systems	B=16 AB=17	B=11 AB=17	AB=11 B=BE=5	E=9 AB=5	AB=8 B=7	AB=9 BE=5
12. Site Planning	B=29 AB=31	B=AB=28 A=11	B=19 AB=13	E=16 BE=CE=9	B=20 AB=16	B=21 AB=19
13. Landscape	B=33 A=9	B=35 AB=5	B=23 E=12	E=19 BE=13	B=23 E=9	B=24 E=8
14. Furniture & Furnishings	B=25 A=11	B=27 E=A=BE=4	B=17 BE=11	BE=12 E=11	B=16 BE=8	B=16 BE=9
15. Other 1 - project management	-	A=1	-	-	-	-
16. Other 2 - interiors	-	A=1	-	F=1	-	-
17. Other 3	B=A=AB=1 -	A=B=AB=1 -	B=A=AB=1 -	E=D=B= ABCE=1	C=A=AB=1 -	E=A=B= ABCE=1

N=75

Source: Firm Questionnaire IV.4

TABLE II.D.5

Percentage of Firms using Supervised Paraprofessionals by stage of Design Process

PROCESS STAGE

FIRM TYPE (Process)	Number of Firms	Client Consultation	Conceptual Design	Detailed Design	Drawings	Specifications	Supervision	Mean
ARCHITECTURAL (architectural)	(n=257)	7.4	11.3	46.7	66.5	28.8	39.7	33.4
ENGINEERING (structural)		6.0	7.8	15.0	42.8	17.8	23.1	18.8
ENGINEERING (mechanical)	(n=320)	7.2	9.1	15.9	23.4	14.4	16.6	14.4
ENGINEERING (electrical)		9.7	11.3	21.6	30.3	19.1	17.8	18.3
MIXED (architectural)		13.3	21.3	53.3	66.7	38.7	34.7	38.0
MIXED (structural)	(n=75)	13.3	14.7	38.7	46.7	33.3	30.7	29.6
MIXED (mechanical)		9.3	16.0	32.0	37.3	30.7	24.0	24.9
MIXED (electrical)		6.7	13.3	21.3	28.0	18.7	17.3	17.6

Source: Firm Questionnaire IV.4

TABLE II.D.6

Percentage of Firms using Unsupervised Paraprofessionals by stage of Design Process

PROCESS STAGE

FIRM TYPE (Process)	Number of Firms	Client Consultation	Conceptual Design	Detailed Design	Drawings	Specifications	Supervision	Mean
ARCHITECTURAL (architectural)	(n=257)	2.3	3.1	9.3	18.3	7.8	10.1	8.5
ENGINEERING (structural)		2.8	3.1	5.6	10.9	4.5	9.1	6.0
ENGINEERING (mechanical)	(n=320)	3.8	4.4	6.6	9.1	5.3	7.2	6.1
ENGINEERING (electrical)		4.4	4.4	7.2	10.6	6.3	8.1	6.8
MIXED (architectural)		2.7	0	8.0	18.7	9.3	10.7	8.2
MIXED (structural)	(n=75)	1.3	1.3	5.3	8.0	8.0	8.0	5.3
MIXED (mechanical)		2.7	4.0	8.0	8.0	6.7	6.7	6.0
MIXED (electrical)		1.3	2.7	8.0	5.3	5.3	5.3	4.7

Source: Firm Questionnaire IV.4

in particular use supervised paraprofessionals at the detailed design and specifications stage, most frequently for architectural design.

On the other hand, it appears that supervised paraprofessionals are less used at the client consultation and conceptual design stages. Between 9% and 21% of firms use them for conceptual design, and from 6% and 13% for client consultation.

Significant differences between firm types are apparent with respect to the percentage of firms which use supervised paraprofessionals at any stage. The mean participation figures (calculated with respect to all stages, and therefore not to be equated with the percentage of firm types which employ paraprofessionals) vary from 38% for architectural work in mixed firms to 14% for mechanical design in engineering firms. The mean participation rate in all engineering firms is 17% and 28% in mixed firms. Mixed firms, therefore, make more extensive use of paraprofessionals than do engineering firms, but less than architectural firms.

The pattern is similar with respect to unsupervised paraprofessionals, as indicated in Table II.D.6. Unsupervised paraprofessionals are most used at the drawings stage by all firms, and least in client consultation and conceptual design. Unsupervised paraprofessionals are most used by architectural firms and least by mixed firms in structural and electrical work, but the differences are not large.

3. Summary

The tradition in some building design firms prior to about 1950 was to educate professionals through a system of apprenticeships, whereby most of the knowledge a professional acquired was passed down to him through the firm. Progress through the firm depended, of course, largely upon the ability to show competence on the job. Perhaps the engineering pattern of using paraprofessionals "at the front end" is a remnant of this legacy, one which has now disappeared in architectural practice and in the organized structure of large mixed firms. On the other hand, perhaps it is this kind of structure which permits mixed firms to employ more paraprofessionals, relative to professionals, than other firm types. Table II.D.7 contains manpower data by firm type, and we see that they are consistent with the participation rate figures discussed above. There are more paraprofessionals than professionals in mixed firms, and their numbers are about equal in engineering firms. These ratios have remained more or less stable since 1973, so that the strong growth of engineering and mixed firms has sustained the employment rate of paraprofessionals. In architectural firms, however, their numbers have declined both relative to professionals and - because architectural firms have not grown - in absolute terms. In 1977 there were about two professionals for every paraprofessional in the average architectural office.

While the fields in which paraprofessionals - supervised or otherwise - operate are restricted, the tables

TABLE II.D.7

Professional and Paraprofessional Manpower by Firm Type, 1973-1977

FIRM TYPE		1973	1974	1975	1976	1977
ARCHITECTURAL	Total Profs.	2.5	2.7	2.8	2.9	2.9
n = 296	Total Paras.	2.1	2.0	2.1	2.3	1.8
	% Paras	45.7	42.6	42.9	44.2	38.3
ENGINEERING	Total Profs.	3.2	4.1	4.0	4.3	4.6
n = 687	Total Paras.	3.3	3.9	4.3	4.7	4.5
	% Paras.	50.8	48.8	51.8	52.2	49.5
MIXED	Total Profs.	13.1	15.5	17.4	18.6	19.6
n = 94	Total Paras.	16.2	20.2	23.7	24.5	24.6
	% Paras.	55.3	56.6	59.1	57.7	55.7

Source: Firm Questionnaire IV.4

suggest that some intra-firm mobility does take place, particularly in engineering offices. Interviews with principals and paraprofessionals also reveal the wish on the part of both professionals and paraprofessionals to maintain a flexible manpower framework, whereby competent and experienced paraprofessionals can assume professional roles.

However, the issues of supervision and final responsibility still need to be addressed. Bearing in mind the questions that were raised in section II.D.1 above, these issues will not be easily resolved, although there is a proposal with some far-ranging measures recommended by OACETT.[45]

There appears to be a readiness, on the part of the engineers at least, to permit unsupervised paraprofessionals to function in areas where codes, regulations and public inspections guarantee public safety. As the APEO admits,[46] and our data suggest, paraprofessionals already perform this kind of work, so perhaps it could be legally sanctioned without damage to the public interest.

We are left, however, with the professional position which claims that paraprofessionals lack the essential qualities of creativity and management ability, which are to be acquired only through appropriate professional education. This position is held so unequivocally that an

opposing view is bound to be strongly resisted. The position may, moreover, be substantially correct in which case the public interest would be jeopardized by sanctioning complete professional/paraprofessional substitutions.

There might be some merit, instead, in an incremental policy, which is hardly a novel one. Provisions for paraprofessionals to gain professional status, through part time study leading to examination by the APEO and the OAA, currently exist, and might be revised over time.

Given the declining enrolments in universities and their general willingness to entertain part time study, they should not regard such policies as untenable. The graduation of knowledge and responsibility, which now is sharply interrupted by distinction made between professional and paraprofessional, would more closely reflect that required by current practice.

FOOTNOTES TO CHAPTER II

1. H. Simon, The Sciences of the Artificial (Cambridge: M.I.T. Press, 1969).

2. B. Archer, "An Overview of the Structure of the Design Process." Emerging Methods in Environmental Design and Planning, ed., G. Moore, (Cambridge: M.I.T. Press, 1970).

3. E.H. Gombrich, Art and Illusion (London: Phaidon, 1965).

4. M. Middleton, Group Practice in Design (London: Architectural Press, 1967, p. 92).

5. G. Moore, Emerging Methods in Environmental Design and Planning (Cambridge: M.I.T. Press, 1970, p. 283).

6. Including and increasingly so, the environmental control systems. See R. Banham, The Architecture of the Well-Tempered Environment.

7. C. Norberg-Schultz, Intentions in Architecture (Cambridge: M.I.T. Press, 1965).

8. Thus a house, to its owner, takes on a meaning and appearance that are unique, and that transcend its formalistic characteristics. That is why in some quarters "aesthetics" is now subject to a much broader interpretation than hitherto.

9. In fact, the more extreme neo-functionalists still claim that the form of buildings should emerge from, and only from creative arrangements of the physical control and accommodation systems. For an illustration of system interdependency refer to the case studies in Appendix C.

10. Often-cited examples of "aesthetic" engineers are Pier Luigi Nervi, Robert Maillart and, of course, Buckminster Fuller. Space allocation programs usually employ linear programming to minimize a total "energy cost" function based on trip frequency and trip cost. Graph theory, applied for example to networks of rectangular parallelepipeds shows particular promise for space allocation procedures.

11. Other forms of public and quasi-public controls are of only marginal interest to this study, and include the standardization and modular coordination of building materials to improve the economics and efficiency of construction.

12. See the Metro library case study described in Appendix C.

13. And other quasi-governmental regulations, such as those administered by the Central Mortgage and Housing Corporation.

14. Architecture Interviews and Engineering Interviews.

15. This position has been extensively documented, particularly by the "manipulated city" theorists of City Magazine.

16. These shifts have transformed the Ontario planning profession in the space of ten years, and in Scandinavia, Germany and the United Kingdom have transformed the architectural design process such that government and citizen participation occurring at the outset of most projects is now legally sanctioned.

17. See the Metro library case study in Appendix C.

18. For a discussion of the economic ramifications of this kind of scenario, see G. Tullock, Private Wants, Public Means, (New York: Basic Books, 1973).

19. Except where environmental externalities are concerned, and through the routine government administration of building codes.

20. See the Metro library case study in Appendix C.

21. Barnett, J., Urban Design as Public Policy, 1973.

22. See the regional data in Chapter III, Table III.B.10.

23. See the section on staff functions by firm type below.

24. See Chapter III for a discussion of this issue.
Data from the OAA show the number of architectural firms grew from 337 in 1973 to 589 in 1978, a 75 per cent increase, while APEO data show that firms authorized to practise professional engineering rose from 1,048 in 1973 to 1,454 in 1977, a 39 per cent increase. Combining these data with the firm size data suggests that engineering practice grew modestly more than architectural practice.

25. See Chapter III.

26. As acknowledged and sanctioned by The Architects Act and The Professional Engineers Act.

27. The condensation omits areas A5, A6 and B3, this data being of only marginal interest to the substance of this chapter. Chapter III, however, takes these areas into account for the economic analysis, which produces a differently structured condensation.

28. See an elaboration of this point in chapter III.

29. This does not seem to apply to structural design.

30. Given the existence of dual prime consultancies, this figure should not be equated with the actual total volume of construction (see the discussion of Tables II.C.21, II.C.22 and II.C.23).

31. See Chapter III for a discussion of fees.

32. There were slight negative correlations between industrial and other building types for engineering firms and mixed firms, but none were strong enough to suggest that a high degree of specialization around industrial buildings actually occurs. This is not to imply, of course, that individual firms do not engage in this, or types of specialization.

33. Our survey covered firms in business in 1977, and inquired as to their staff size over the previous five years. This gives a good time profile of the 1977 firms, but tells nothing about firms that may have disappeared between 1973 and 1977. Unless architectural and engineering firms disappeared at the same rate, our data will not perfectly reflect the entire market.

34. Ontario Association of Certified Engineering Technicians and Technologists, Brief to the Professional Organizations Committee, Realities and Responsibilities, October 31, 1977.

35. OACETT, ibid., 4-6.

36. Some such American programs, for instance, are based in universities and offer a four-year degree. The Ontario Colleges of Applied Arts and Technology, and Ryerson Polytechnical Institute, offer three-year diploma programs. Some Ontario colleges have developed two-year programs for architectural and engineering technicians.

37. W.F. Mullen, "The Ontario Technologist," (Journal of OACETT) Vol. 12, No., 2, March/April, 1970.

38. Mullen, ibid.

39. McHenry, "The Ontario Technologist" (Journal of OACETT), Vol. 12, No. 2, March/April, 1970.

40. Canadian Council of Professional Engineers - "Committee on Policy - Engineers, Engineering Technicians and Technologists," October, 1972.

41. Ontario Association of Architects, Brief to the Professional Organizations Committee, July, 1977.

42. Association of Professional Engineers of Ontario, Brief to the Professional Organizations Committee. October, 1977, p. 35.

43. APEO, ibid., p. 36.

44. See Appendix C to the Research Directorate's Staff Study, "History and Organization of the Architecture Profession in Ontario," 1978 and Appendix D "History and Organization of the Engineering Profession in Ontario" (1978) for further discussion of this point. Realities and Responsibilities, a brief to the Professional Organizations Committee from the Ontario Association of Certified Engineering Technicians and Technologists (October 31, 1977) implies the existence of 124 technician and technology specializations in engineering alone (p. 41).

45. OACETT, op. cit., pp. 53-61.

46. APEO, op. cit., p. 34.

CHAPTER III

ECONOMIC ANALYSIS OF PROFESSIONAL PRACTICE

D. Dewees

A. OVERVIEW OF THE ECONOMIC ISSUES

This chapter will examine four economic issues in an attempt to shed some light on the economic consequences that might follow from alternative legislation governing the practice of architects and engineers in Ontario. The economic analysis of professional practice is in its infancy, so there is no established format that will lead quickly to the most pressing policy questions. Instead, we must proceed in an exploratory manner to present the theoretical concepts that are relevant to the regulation of professional practice and the performance of the professions and to analyze the factual evidence that has been gathered in Ontario to date. This economic analysis will be applied to the particular problems of professional regulation to the extent possible, taking into account the information gathered and the analysis performed by the team.

The first economic issue to be considered is the relationship of industrial structure to the conduct and performance of the industry, in this case the "industry" being the provision of professional services by architects and engineers. The second issue is the prevalence and degree of imperfect information available to clients about the firms or work that they contract. Third is the question whether future consumers of the services are adequately represented in transactions between clients and professionals. Fourth is a discussion of the interests of non-

client consumers, such as neighbours of a building that is being designed.

The first two of these issues are relevant to all aspects of engineering and architectural practice. We will discuss them in appropriately general terms, using data from a sample of all firms. However, we have selected building design and to a lesser extent highway design as fields of practice for special emphasis. Thus we have significantly more data analysis for firms in building design than for those in other areas. The third and fourth issues are really relevant primarily in the field of building design, and are discussed only in terms of this field of practice. The discussion of the third and fourth issues is quite brief, since we have not gathered data specifically related to these issues.

1. The Relationship of Industrial Structure to Conduct and Performance

It is a fundamental principle of the branch of micro-economics known as "industrial organization" that the structure of an industry will influence that industry's conduct and these two will dictate its performance.[1] By structure we mean certain characteristics of the industry such as the size distribution of buyers and sellers, and barriers to entry. Conduct is the behaviour of the members of the industry and their clients. Performance is the evaluation of the results of this conduct, including economic efficiency, progressiveness and equity. This study will examine the structure of two professions in Ontario,

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prices, 2. policies toward setting the quality of the product, 3. policies aimed at coercing rivals. All three of these elements of conduct will be examined in this study.

The structure of the industry will determine to some degree the scope that firms have for choosing their conduct. If the industry is perfectly competitive, with large numbers of sellers of an undifferentiated product, then the firm has little scope for choosing its conduct.[7] The market will set the price for the product, leaving the firm no room for deviation. The absence of product differentiation means that there is no opportunity to vary product quality, or to use advertising. There is no point in coercing a rival since many others can replace any rival who is prevented from competing. Competition also assures that performance will be efficient, since the inefficient firm will quickly be driven out of business.

At the other extreme, a monopolist is also constrained in his choices.[8] He will maximize his profits at a certain price and output level, with a certain degree of product quality and advertising. If he decides to maximize profits, then he must determine the profit-maximizing conditions, but there are no other choices left to him. The range of choices is opened only if he decides to maximize something other than profits, in which case it is difficult to predict his behaviour until his objective function is known. There is some debate over how efficient a monopolist will be in his production decision.

It is in the case of an oligopoly, with a small number of sellers, that the range of choices opens up.[9] Because

an oligopolist knows that his decisions will affect those of his rivals, the decision-making process is more complex. Firms can differentiate their products and charge different prices without being driven from the industry. The performance of the industry in terms of efficiency, progressiveness and even equity will depend upon the conduct chosen by the firms.

The above should indicate briefly what we hope to accomplish in analyzing structure, conduct and performance in this chapter. We are looking for indications of the efficiency with which professional firms provide their services, the prices charged and the quality of service rendered. We are looking for progressiveness in developing and adopting new services and technology to serve clients better or at lower cost. We are looking for equity measured by similar treatment of similarly situated clients. To the extent that these things cannot be measured directly, we will try to infer them from structural and conduct information.

2. Imperfect Client Information

One of the principle reasons for regulation of the professions of architecture and engineering is the belief that buyers of these services are not necessarily technically competent to evaluate the work done for them and that the public must therefore be protected from unscrupulous practitioners. While this issue is central to any discussion of regulatory forms, it is not well dealt with by the traditional industrial organization study discussed in the preceding section. We will add this important issue to the analysis, where relevant.

The problem here is not simply that some practitioners will produce higher quality work than others. Variations in quality may be acceptable or even desirable, so long as they are understood by and desired by consumers or clients. For example, in some cases it may be particularly important that a building be aesthetically attractive and compatible with its surroundings, as in the case of a new building in an important and well-preserved historic area. In other cases, the most important characteristic of the design might be its efficiency, reflected in low initial cost and upkeep, if the building is in a location where exterior beauty was irrelevant and budget considerations were paramount. Since prospective building owners may legitimately have different objectives, it is important that they be able to select firms that can meet their particular objectives. It would be wasteful to insist that all buildings meet the highest standards of beauty when this would in some cases not be appreciated.

On the other hand, it would be a serious problem if some designers' buildings were noted for their beauty, and others for their economy, if clients could not distinguish one from another. If most clients are sophisticated in their selection of and dealings with a professional, then there is little need for regulating the practice in the interest of protecting the public. If, on the other hand, a significant portion of the clients of these professions are not sophisticated, in that they cannot distinguish the quality of work done by different firms and cannot judge the quality of work being done for them, then some non-market mechanism might be desired

to protect the public from undesired variations in quality, and unfair deviations of price and quality.

The theoretical considerations that bear on this issue will be developed in this study. In addition, the available information will be discussed within the framework of the available theory. Unfortunately, it is difficult to assess the sophistication of clients, even with the extensive survey instruments used on clients and firms in this study. Still, some informed judgments can be made based on the data gathered here. At least, we will assess how serious a problem this is, and try to enrich the industrial organization discussion with specific consideration of these information problems.

3. Future Consumers

It is sometimes also suggested that professional regulation is necessary in the area of building design because the dealings between the owner and designers may ignore the interests of future owners. It is thought that building design will not sufficiently reflect a consideration for future operating costs, maintenance, and building life. A counter argument is that in the case of large buildings the future owners will be sophisticated and can evaluate the probable operating and maintenance costs rather accurately, as well as estimating remaining building life. Thus a building that is poorly designed with respect to these factors will command a lower price than one that is well designed. So long as the builder knows this, he must consider the wishes and interests of future buyers.

The problem, then, is to determine the extent to which the economic counter-argument is actually operative. Perhaps it is operative only for buildings of a given type or size. Perhaps it is operative only under certain market conditions. Evidence on the operation of this market is difficult to gather, and has not been obtained for this study. Thus we can only point out that whether future consumers require protection is an empirical issue. It should not be assumed that they are ignored simply because they are not party to the original design arrangements.

4. Non-client Consumers

Many persons concerned with city planning and building design express concern that the interests of all affected parties may not be considered in dealings between the building designer and the owner. Those who own property, live or work in the vicinity of a proposed building may be significantly affected by many aspects of the design of the building. Local zoning legislation is designed in part to protect the interests of neighbours, as are some aspects of planning legislation and regulations and even building codes.

The question for this study is what role the professional regulation of the engineer or architect can or should play in protecting these interests. Given the existence of zoning, planning and building laws, is any further protection needed? If so, is professional regulation an efficient and sensible means of providing this protection?

Economic theory recognizes that in urban areas these effects on non-client consumers (externalities) exist, and provide a justification for some government intervention. This theory has little to say about the proper form and extent of that intervention. The rather limited information on this subject that is available to us is discussed in Chapter II.

B. MARKET STRUCTURE

The importance of market structure has been defined by Caves:

> "Market structure is important because the structure determines the behaviour of firms in the industry, and that behaviour in turn determines the quality of the industry's performance. Explaining that quality of performance - the industry's contribution to attaining our major economic goals - is our ultimate objective."[10]

If the structure of an industry can be described, one should be able to predict much about its performance and about how changes in structure might change that performance. This should be as true for the professions as for the manufacturing industries to which such studies have been most often applied. The elements of market structure considered here are market definition, firm size distribution, characteristics of clients, product differentiation, and barriers to entry.

1. Market Definition

Before one can talk about the number and size distribution of buyers and sellers in a market, the boundaries of that market must be defined. In the professional area, do

all architects and engineers constitute a single market or two markets? Should those firms that deal in building design be designated as a separate market? Should each specialty, such as structural engineering, be a separate market? Furthermore, what are the geographical market boundaries? Should all of Ontario be regarded as a single market, or is every city a separate market? How should firms from other provinces or from abroad be treated? These and other questions must be answered before we can analyze the structure of the market.

Since the purpose of determining industry structure is to ascertain the degree of competition in the industry, the tests for drawing market boundaries should identify the degree of interrelationship between elements of the market. A market should consist of those firms that are close substitutes for each other measured by the services they can provide.[11] Thus a market definition that separates firms that do not and could not provide similar services, such as a firm of chemical engineers and a firm of structural engineers is more useful than one that groups these together. We have therefore tried to determine from the questionnaire of firms what services are supplied by each firm, and in what areas they possess expertise. Analysis of the answers to these questions should show which services tend to be offered together (and therefore constitute a single market) and which are offered in isolation. We will, however, examine seller concentration using market definitions of several alternative degrees of specificity. It is common to do this in industry studies, in recognition that no single

market definition is likely to be satisfactory for all purposes.

In addition to defining a product market, we must define the geographical market. For some purposes, we will treat all of Ontario as one market. We shall also treat Metro Toronto as an identifiable market. In addition, we will use information from the firm survey about the location of their clients, and from the client survey about how far clients searched for professional firms to try to define the geographical range over which firms operate and compete. Because of data limitations, the only market boundaries we can draw are: the entire Province; the home town of the firm; and the first letter of the postal code, of which there are five in Ontario. This will give three alternative levels of geographical division for analytical purposes.

a) Product Market

The analysis below describes the activities engaged in by architectural, engineering and mixed firms. In addition, it provides some information on product market boundaries from the point of view of substitution in production - the ability of a firm doing one thing to do another. We are looking for the narrowest activity definition such that the ability to perform one activity does not imply the ability to perform some other. This allows us to isolate markets in which it is sensible to assume that all firms in the market are in competition with each other. We assume that there is little substitution in consumption, since if you need to design a system to carry away

waste water, no amount of electrical design will solve the waste water problem.

The questionnaire of firms asked all firms to show the percentage of gross billings attributed to each of a dozen fields of practice. The response to this question is shown in Table III.B.1 with responses weighted by firm size. (See Table II.C.7 for the same data not weighted by firm size.) It is clear that building design accounts for the largest proportion of the billings of firms of all three types. Architects are most highly concentrated in buildings with 88% followed by engineers at 25% and mixed firms at 21%. The next highest activity for architects is urban and regional planning at 4.8%; for engineers it is municipal services at 15%; and for mixed firms also municipal services at 12%. Land transportation work on bridges, tunnels, highways and railways accounts for 8% of engineering billings and 8.9% of mixed billings, while "other" transportation work accounts for 1.3% and 1.6% respectively. Architects show less than 1% of their billings in this field.

If we average the highest percentage ranking for each firm, the architects allocate an average of 92.7% of their billing to their highest field, engineers allocate 78.8% and mixed firms 76.2%. This suggests that according to these field definitions, most firms of all types focus on one field. If we sum the four highest percentages for each firm, the mean of this four-activity sum is 99.5% for the architects, 97% for the engineers, and 96.9% for the mixed firms. This confirms a high degree of specialization among firms, with most activity for

TABLE III.B.1

Relative Activity in Fields of Practice[a]

Field	Percentage of Gross Billings		
Firm Type:	Architectural	Engineering	Mixed
1. Agriculture, fisheries, forestry, forest products	<1	3.3	<1
2. Air and sea ports, harbours, terminals, coastal works	<1	2.0	5.0
3. Bridges, tunnels, highways and railways	<1	8.0	8.9
4. Buildings	88.	25.3	21.4
5. Dams, irrigation and flood control	<1	2.0	4.2
6. Plant process design	<1	9.1	8.0
7. Mining and metallurgy	<1	6.3	11.5
8. Municipal services	<1	15.4	12.3
9. Petroleum and natural gas	--	4.2	2.6
10. Power generation, transmission and generation	--	7.3	9.8
11. Telecommunications	<1	3.2	1.9
12. Urban and regional planning	4.6	3.6	8.6
13. Other - Transportation	<1	1.3	1.6
14. Other - Consulting	--	<1	1.1
15. Other - Land development	--	<1	--
16. Other - New design	1.8	1.2	<1
17. Other - other	2.8	7.1	3.2
Mean of highest %	92.7	78.8	76.2
Mean of sum of four highest %	99.5	97.0	96.9
Number of firms responding	270	646	89

a. From the percentage of each firm's gross billings in each field. Weighted by firm size (except for the means).

Source: Firm Questionnaire III.3

each firm in one field, and negligible activity outside four fields. The architectural firms are most specialized, and the mixed firms most generalized.

While the list of fields shown in Table III.B.1 is a standard list of fields used in these professions, it is possible that it might be further simplified. Perhaps some of the fields are closely related in that a firm that practises in one field will tend to practise in another particular field as well. This seems unlikely from the degree of specialization found already, but it is not impossible.

To test the possibility of a relationship between these fields, we have calculated simple correlation coefficients between the level of activity of firms in the various fields, separately for architectural, engineering and mixed firms. In general, the correlations were very small, with a majority smaller than 0.10 and very few greater than 0.5. The few high correlation levels that occurred were not the same for the three firm types. Thus for architectural firms, the correlation between bridges, tunnels, highways and railways and municipal services was +.52, but the cell size was very small (very few firms were involved in all these fields), and the other firm types did not show a high correlation between these fields. Among engineering firms, the highest correlation coefficient was 0.15. Mixed firms showed a high correlation between power generation and petroleum, but again the cell size was small.

From these results, we conclude that firms tend to practise primarily in one of the specified fields, with limited

activity in three or fewer other fields. There is no systematic relationship between practice in any one of the fields and practice in any other. Each field is distinct.

We can further analyze the divisions of the market for these professional services by focusing on specialties within one of the fields already identified. Firms that indicated a significant activity in building design were asked to rank their level of expertise in each of 15 specialized activities using a scale with 1 indicating considerable expertise and 4 indicating no expertise. The responses to this question were discussed above in Chapter II.C.2. A detailed summary of the responses is shown in Table III.B.2.

The picture that emerges from this table and from Chapter II.C.2 is that architectural and engineering firms tend to claim high levels of competence in different activities, but many firms claim some competence in the same activities, and some activities are clearly claimed by both. The mixed firms are predictably diverse, claiming high levels of expertise in a large number of activities. Thus they look like a combination of architectural and engineering firms, which many are.

In addition to identifying activities in which firms claim high levels of expertise, we have studied the grouping of activities by firms, to see whether any of the activities in the list used here occur together to an extent that indicates that they might reasonably be treated as one. Correlation coefficients for the levels of expertise claimed by the

Table III.B.2

Specialized Expertise of Firms in Building Design
(Per cent of firms reporting various levels of expertise)

Activity	Firm type / Expertise level	Architects				Engineers				Mixed			
		1	2	3	4	1	2	3	4	1	2	3	4
		%	%	%	%	%	%	%	%	%	%	%	%
Structural systems		5	21	48	27	41	11	12	37	58	11	15	17
Heating, ventilation, air conditioning		2	5	39	54	26	11	13	50	40	7	17	37
Plumbing		2	13	41	44	24	13	16	47	37	9	21	33
Electrical & Communications		2	11	35	52	27	9	14	50	41	5	20	34
Enclosures		82	8	3	6	33	12	10	45	67	11	9	13
People movement systems		27	19	20	35	4	4	12	80	17	22	26	34
Acoustical systems		14	24	30	32	3	10	18	69	9	26	33	32
External appearance		96	2	1	2	9	16	18	57	67	13	8	12
Interiors		82	15	2	2	7	9	18	66	46	26	16	12
Furniture & furnishings		45	34	16	6	2	4	7	87	22	30	20	28
Landscapes		26	43	22	9	3	8	19	70	21	32	34	13
Building space layout		94	4	1	2	23	18	15	44	74	16	8	3
Site planning		85	11	2	2	27	22	14	38	74	11	12	4
Project management		27	36	19	19	35	20	13	32	50	28	13	9
Construction management		22	25	27	26	35	17	17	32	37	26	24	13
Number of firms responding		264				338				76			

Source: Firm Questionnaire IV.2

firms were calculated for all activities for each firm type. (See Tables II.C.10,11,12). Heating, plumbing and electrical showed high correlations (from .51 to .90) for all firms. Building space layout and site planning had correlations of .52 for architects, .74 for engineers, and .75 for mixed firms. Project management and construction management had correlations of .64 for architects, .83 for engineers, and .68 for mixed firms. Since these specialties tend to be practised together in firms of all types, each grouping might be treated as a single specialty as far as the firms are concerned. They seem to be substitutes in production. Thus, for purposes of defining the product market, we can use the groupings rather than the original list, leaving a reduced list of 11 specialty areas after grouping. See Table III.B.3.

While there might, in principle, be problems in calculating correlation coefficients based on an ordinal ranking of expertise, the results obtained here were tested for robustness. We calculated the correlations first defining high expertise as a rating of number one, and then as a rating of number one or two. The correlation coefficients were very similar using both methods.

The degree of specialization of individual firms can be seen by calculating the average number of activities in which firms rank their expertise as number 1, using the reduced list of 11 activities. The results are shown in Table III.B.4. Architectural firms claim considerable expertise in an average of 4.8 activities, and no expertise in only 1.9.

Table III.B.3

Consolidated List of Areas of Expertise

Name	Areas included
1. Structural systems	structural systems
2. Circulation	heating, ventilating and air conditioning plumbing electrical and communications
3. Enclosures	enclosures
4. People movement	people movement systems
5. Acoustical systems	acoustical systems
6. External appearance	external appearance
7. Interiors	interiors
8. Furnishings	fixtures and furnishings
9. Space	building space layout site planning
10. Landscapes	landscapes
11. Management	project management construction management

Table III.B.4

Range of Expertise of Firms in Building Design

Average Number of Activities Ranked[a]

Expertise Level	Architects	Engineers	Mixed
1	4.8	1.7	4.4
2	2.1	1.3	2.5
3	2.2	1.8	2.1
4	1.9	6.2	2.1
Number of firms responding	264	338	76

Source: Firm Questionnaire IV.2

a. The activity list is the same as that in Table III.B.3.

Engineering firms claim considerable expertise in only 1.7 activities, and no expertise in 6.2. Mixed firms claim considerable expertise in 4.4 activities and none in 2.1. Thus the engineering firms are most specialized and the architectural and mixed firms most generalized, according to this activity listing.

By the definition of a product market adopted at the start of this section, it is clear that each of the fields of practice shown in Table III.B.1 is a separate product market. On the other hand, in the field of building design, the activities listed in Table III.B.2 are not necessarily all separate product markets. Instead, this list of 15 activities can be collapsed into eleven activities by grouping together: structural systems, heating ventilation and air conditioning, and plumbing; building space layout and site planning; and project management and construction management. The shorter list of 11 activities can be taken to define 11 relatively independent areas of practice within the building field. An average firm will claim considerable expertise in several of these areas, with engineering firms claiming the fewest areas, and mixed firms the most. While a firm may practice in more than one area, we cannot predict which areas will go together; in this sense they are independent.

Finally, there is the question whether performing a given service constitutes a separate market for different building types. In other words, does a structural engineer who does institutional work compete with one who does office

commercial work? Unfortunately, our firm questionnaire does not provide the data necessary to answer this question. From the firm interviews, it appeared that many firms tended to do work in one or a few particular building types, in part because they would develop a reputation in one type, and tend to receive other commissions in the same area. This seemed to be particularly true of architectural firms, and engineering firms that worked as prime consultants. It is not clear, however, whether this tendency is so strong that various building types constitute separate markets. The relationship between activity in various building sizes is discussed elsewhere in this report.

b) Geographical Markets

The relevant question for defining geographical markets is: over what area do firms compete? Do most firms seek commission only in their home town, in a 20 mile radius, a 50 mile radius, their first postal code letter, the whole Province, or some larger area? Over what area do clients search for professional firms?

We can begin by considering the location of the professional firms themselves. Table III.B.5 shows the number of firms located in municipalities of various size categories. Over fifty per cent of architectural firms are located in cities of more than 500,000 population, which includes only Toronto and Ottawa-Carleton. About fifty per cent of mixed firms are in that size category, and just 39 per cent of

Table III.B.5

Location of Firms by Size of Municipality

Size of Municipality (000)	Architectural No.	%	Engineering No.	%	Mixed No.	%
< 5	2	1	20	3	--	0
5 - 30	17	6	69	10	3	5
30 - 100	33	11	115	17	9	8
100 - 500	83	28	218	32	34	38
> 500	165	55	265	39	48	49
Total	300	100	687	100	94	100

Source: Firm Questionnaire I.2

Table III.B.6

Distribution of Ontario Population by Size of Municipality

(1971 census)

Size of Municipality (000)	Population (000 persons)	(%)
< 5 (includes rural)	1761	23
5 - 30	917	12
30 - 100	897	12
100 - 500	1357	18
> 500	2768	36
Total	7700	100

engineering firms. Thus the architectural and mixed firms are more concentrated in larger cities than are the engineering firms. Comparing this distribution with the distribution of population shown in Table III.B.6 shows that all three types of firms are more concentrated in larger cities than is the population. The smallest municipal size category that includes all rural areas includes only a few per cent of the firms, but 23 per cent of the population. The response to this question may be biased toward large cities if firms in a suburban municipality reported their location as being associated with the larger center city. For example, a Mississauga firm located in zone L might report that it was in a city of over 500,000, thinking of Toronto.

Counting the number of firms does not, however, indicate the actual amount of professional activity, because of the large variation in firm size. We have computed a measure of firm size (described later in this report) and counted each firm by its size, rather than equally. The result of this size-weighted distribution is shown in Table III.B.7. Comparing this with the unweighted table shows that the size-weighted distribution is even more heavily oriented to the larger cities. It appears, not surprisingly, that the larger firms are in the larger cities. Since the mixed firms are larger on the average than the other types, 81 per cent of their size is in the over 500,000 category.

Another locational division for which data are available is the first letter of the postal code. Ontario

Table III.B.7

Location of Firms by Size of Municipality

(Number of firms weighted by firm SIZE, expressed as a percentage of total SIZE)

Size of Municipality (000)	Architectural	Engineering	Mixed
< 5	.25	1.1	--
5 - 30	2.7	10.	.3
30 - 100	7.7	13.	3.5
100 - 500	25.	28.	16.
> 500	65.	49.	81.
Total	100.	100.	100.

includes five different letter areas. Area K covers Eastern Ontario from Ottawa to Cobourg and Lindsay. Area L is central Ontario from Oshawa to Orillia to Oakville including the Toronto suburbs, but excluding Metropolitan Toronto, which is area M. Area N is Southwestern Ontario, including Hamilton, Guelph, Owen Sound and everything to the south and west. Area P is Northern Ontario from Huntsville to the Manitoba and Quebec borders.

Table III.B.8 shows the location of firms by postal code measured by the number of firms and by the size-weighted number of firms. About 64% of the architectural firms are located in Metropolitan Toronto, representing 69% of the size. Another 15% of firms are located in Central Ontario around Toronto in area L. Northern Ontario has the smallest number of firms, but Southwestern Ontario has the smallest aggregate size.

Engineering firms are less concentrated in Toronto, with 39% of firms in Metro Toronto representing 50% of the size. Area L has 25% of the firms representing 24% of the size. Northern Ontario has both the least number of firms and the smallest size.

An anomaly of Table III.B.8 is that it shows more firms in Metropolitan Toronto than Table III.B.5 indicates to be in cities of over 500,000 population. This can only be explained by assuming that firms located in suburban municipalities such as Scarborough and Etobicoke identified themselves with the size of the municipality, not the Metropolitan unit. The postal code and city size data come from separate questions.

Table III.B.8

Location of Firms by Postal Code Weighted by Firm Size

First Letter of Postal Code	Architectural Firms		Engineering Firms		Mixed Firms	
	Number	Size Weighted	Number	Size Weighted	Number	Size Weighted
K	27	227	85	1050	4	246
L	42	262	173	2227	14	192
M	181	1498	276	4645	52	4958
N	21	79	93	1026	13	465
P	12	95	26	351	4	94
Total	283	2161	699	9298	87	5954

Source: Firm Questionnaire I.1

The mixed firms are most concentrated, with 60% of the firms in Metro Toronto and 83% of the aggregate size in the same area. Thus the variation in firm size is greatest in the mixed firms, and the largest of those are more heavily concentrated in Toronto than either of the other firm types.

The analysis above has shown the distribution of professional firms across Ontario. To define geographical markets, however, we also need to know where the clients of these firms are located. The responses to a question about client location are shown in Table III.B.9. (See also Table II.C.6 above and related discussion.) The first row in the table shows the percentage of clients located in the same town as the firm, if that town is not Metro Toronto. The second line shows the percentage of clients located in Metro Toronto. Where the responses are weighted by firm size, about 22% of the clients of architects are in their home town, and 45% in Metro Toronto. One-quarter are elsewhere in Ontario, and about 9% are outside the Province. The engineering firms have less in their own town, and less in Metro Toronto, with one-quarter of the clients outside the Province. The mixed firms have a very small percentage of clients in their home town, when weighted by size, and almost 30% of their clients are outside the Province. This suggests that the size of the geographical market increases in moving from architectural to engineering to mixed firms. Except for the mixed firms, a majority of the clients are either in the home town or in Toronto.

Table III.B.9

Location of Clients with Respect to Firms
Aggregate Ontario

Client Location	Architectural Firms		Engineering Firms		Mixed Firms	
	Simple[a] %	Weighted[b] %	Simple[a] %	Weighted[b] %	Simple[a] %	Weighted[b] %
Same city as firm (if firm not in Toronto)	27	22	24	16	24	8
Metro Toronto	44	45	30	27	29	23
Elsewhere in Ontario	24	24	30	31	33	41
Other Canadian Provinces	3	6	9	16	8	14
U.S.A.	1	1	4	4	3	8
Other Countries	1	2	4	6	4	6
Total %	100	100	100	100	100	100
Number of firms responding	281		680	664		92

a. Simple average percentage of clients in each category treating all firms equally.

b. Average percentage of clients in each category weighting each firm's percentages by its size.

Source: Firm Questionnaire III.1

This table becomes more useful if the data are rearranged so that all clients located in the firm's home town are listed in the first (own town) category, even if that town is Metro Toronto. This leaves in the Metro Toronto category only those clients of firms not themselves located in Toronto. The remainder of the table is unchanged. This modification weighted by firm size only is shown in Table III.B.10. It is now clear that 64% of the clients of architectural firms are located in the same town as the firm, when Toronto is included. Engineering firms still range somewhat further, with 35% in their home town. Mixed firms cover the largest area with only 27% in their home town even with the revised definition.

Still more information can be derived by looking at the client location for firms in each postal code letter separately. Table III.B.11 shows that the distribution of clients varies substantially from one postal code letter area to another. In general, the Toronto firms do more business outside the Province and outside the country than do other firms, whether architectural, engineering, or mixed. Firms in area L generally do more business in Toronto than any firms except Toronto firms, perhaps simply because of their proximity to Toronto. Other variations are less systematic. The tendency of Toronto firms to range farther than others may be a result of their location, or it might be an indirect result of the larger size of the Toronto firms, if large size tends to facilitate covering a larger geographical area.

From the above, we can see that defining the

Table III.B.10

Location of Clients with Respect to Firms

Aggregate Ontario

(Weighted by firm size)

(Toronto firms shifted to own town)

Client Location	Architectural Firms Weighted	Engineering Firms Weighted	Mixed Firms Weighted
Same city as firm	64	35	27
Metro Toronto (if firm is <u>not</u> in Toronto)	2.9	7.1	2.1
Elsewhere in Ontario	24.7	31	43
Other Canadian Provinces	6.3	16	14
U.S.A.	1.1	3.7	8.5
Other countries	2.1	5.0	6.2
Total	100	100	100
Number of firms responding	281	665	92

Source: Firm Questionnaire III.1, I.1

Table III.B.11

Location of Clients with Respect to Firms by Postal Code

Weighted by Firm Size

(Toronto Clients Shifted to own Town)

Client Location / Postal Code Letter	Per cent of Clients of Firms in Postal Letter				
	K	L	M	N	P
Architectural Firms					
Same city as firm	70	57	63	77	69
Metro Toronto (if firm elsewhere)	5	15	0	11	5
Elsewhere in Ontario	19	25	25	11	26
Other Canadian Provinces	5	2	7	0	0
U.S.A.	0	0	1	0	0
Other countries	1	0	3	1	0
	100	100	100	100	100
Engineering Firms					
Same city as firm	39	26	40	30	39
Metro Toronto (if firm elsewhere)	9	22	0	8	5
Elsewhere in Ontario	43	32	29	29	37
Other Canadian Provinces	5	8	20	28	12
U.S.A.	1	6	3	2	8
Other countries	3	6	7	4	1
	100	100	100	100	100
Mixed Firms					
Same city as firm	45	29	26	26	88
Metro Toronto (if firm elsewhere)	4	10	0	20	3
Elsewhere in Ontario	44	54	43	34	9
Other Canadian Provinces	4	3	14	18	0
U.S.A.	0	2	10	1	0
Other countries	3	2	7	1	0
	100	100	100	100	100

Source: Firm Questionnaire III.1, I.1

geographical market as the home town of the professional firm would be too restrictive since the majority of clients are located outside that area, except for architectural firms. Defining the market as the entire Province would include 90% of architectural clients, almost 70% of engineering clients, and over 70% of the clients of mixed firms. This seems to be a satisfactory definition, but does not preclude some analysis at the level of the postal code first letter since that would include a substantially higher percentage of clients than home town alone. We will therefore consider both the Province and the postal letters to be satisfactory geographic market boundaries, with different implications.

2. Firm Size Distribution: Concentration

Once a market has been defined, the size distribution of firms in that market is the most important characteristic for determining conduct and performance. First we must evaluate alternative measures of size and then the size distribution can be observed and analyzed. A single firm in a market is obviously a monopolist, with the possibility for charging higher than competitive prices and thus earning above normal rates of return. Three to six firms would be regarded as oligopolistic, implying that each firm recognizes that its decisions will affect the behaviour of other firms. Many firms might represent monopolistic competition if the product is differentiated, where the firms attempt to differentiate their products, and thus exercise some market power, but do

not seriously consider the reactions of their rivals. If the product is homogeneous, a large number of firms would be competitive.[13]

This ranking in terms of the total number of firms is most useful if all the firms are of the same size. In practice, there is a wide distribution of firm sizes. To describe concentration adequately, an index must be used that counts not only the number of firms but their sizes. We will use the concentration ratio which specifies the percentage of the market represented by a specified number of firms. For example, a four-firm concentration ratio of 80% means that the largest four firms hold 80 per cent of the market. Scherer[14] suggests that a four-firm concentration ratio of less than 40% is competitive, from 40 to 80% is oligopolistic, and more than 80% approaches monopoly.

a) How should firm size be measured?

One might be tempted to measure firm size by the sales volume of the firm. If the industry is widgets and all widgets sell for one dollar, then one could count either the number of widgets sold or the dollar revenues of the firms and obtain identical measures of firm size. If widgets come in different sizes and prices, then it makes little sense just to add the number of widgets, and focusing on dollar revenues is a more meaningful measure of the size and activity of a firm.

Suppose, however, that some firms are vertically

integrated, mining their own coal and iron ore, producing steel, and ultimately producing widgets, while others buy widget parts and assemble them. Two such firms might each have sales revenues of one million dollars per year, but the first would be a much larger firm in terms of the number of employees, the size of the factory, and the "value added": the work done by the firm. Should we measure firm size by gross sales, or by value added?

If we are interested in determining the competitiveness of the widget market, then the amount of work done by the firms is of little relevance, and gross revenue is probably the best measure of firm size: this tells what percentage of widget sales each firm controls. There is, however, a sense in which the integrated firm exercises more control over its destiny than does the assembly firm, unless the market for widget parts is perfectly competitive. Thus using a value added measure may be desirable because it incorporates some information about the market at earlier stages of manufacturing. Scherer[15] notes that concentration ratios can sensibly be calculated on the basis of sales, physical output, employment, value added, or assets. Past studies seem to have used each of these depending upon what data were available. We are relatively free to choose any of the measures.

In the case of the architects and engineers, we have information on the number of employees in various professional and non-professional categories, gross billings, and net billings. The number of employees is obviously an

employment measure, gross billings is a gross sales measure, and net billings (gross billings less fees paid to sub-contractors) is a measure of value added. In any market we may examine, some firms will be operating as prime contractors and others as sub-contractors. If such a mixture is present, value added (net billings) will be a more consistent measure of size than gross billings, since double counting will be avoided. The number of employees might be a reasonable proxy for value added if wages are consistent across the industry, and if all firms use a similar mix of employees of various skill and wage categories. The more wages and employee composition vary, the less accurate is the personnel measure as an approximation to value added.

The four possible size measures are presented in Table III.B.12. The two staff measures are based on an average over the 1973-1977 period. Where the data are incomplete, or the firm was not in existence for all five years, an average of the valid or existing years is used. The two staff measures are in persons. The fees are total fees over the last three years, in hundreds of thousands of dollars.

The data in Table III.B.12 show that professional services are produced in different ways in the three firm types. In architectural firms, the ratio of professionals to total employees is one to two, while for engineers and for mixed firms it is one to three. It is not clear, however, whether this variation in the proportion of professional and non-professional staff is because of the different activities

Table III.B.12

Firm Size Measures: Means and Sample Sizes

Measure	Mean Size	Sample Size
Architects		
Total Staff[1]	6.5	294
Professional Staff[1]	3.0	290
Gross fees[2]	19.5	178
Net fees[2]	13.9	131
SIZE	7.7	290
Engineers		
Total Staff[1]	12.0	684
Professional Staff[1]	4.3	683
Gross fees[2]	55.8	421
Net fees[2]	41.2	273
SIZE	14.2	683
Mixed		
Total Staff[1]	56.7	94
Professional Staff[1]	18.2	94
Gross fees[2]	72.3	63
Net fees[2]	67.3	40
SIZE	65.8	94

1. Persons, averaged 1973-1977.
2. Hundreds of thousands of dollars total fees, 1975-1977.

Source: Firm Questionnaire II.1, V.1

of the firms, or because of the different size of the average firm of each type. Measured by total staff, engineering firms are twice as large as architectural firms, and mixed firms are almost five times as large as engineering firms. Examination of data behind these averages (not shown in the Table), shows that the staff of architectural firms has not changed significantly, while the number of both professional and total employees of engineering and mixed firms have grown by 50% on the average between 1973 and 1977.

It is difficult to compare the fee data to the staff data because less than half as many firms answered the fee questions completely as answered the staff questions. Net fees are less than gross fees, as one would expect, since the difference is the portion of gross fees passed on to sub-consultants. Nor is there a consistent relationship between net fees and the total staff. In architectural firms the net fees are about $70,000 per staff member, while for engineering firms they are about $114,000, and for mixed firms about $40,000. It seems surprising that salaries, profits or net billings would behave in this way, so we must assume that either the fee data are for firms different than the average or that one set of data is inaccurate.

These doubts about the data are reinforced by an analysis of the correlation coefficients between the different variables. The results of some simple correlation calculations are shown in Table III.B.13. The lowest correlation between the staff measures is .87 for the architectural firms, and the

Table III.B.13

Correlations of Various Firm Size Measures

	Total Staff	Professional Staff	Gross Fees	Net Fees
Architects				
Professional Staff	.87			
Gross Fees	.20	.14		
Net Fees	.30	.20	.83	
SIZE	.997	.91	.19	.29
Engineers				
Professional Staff	.88			
Gross Fees	.07	.10		
Net Fees	.03	.06	.99	
SIZE	.997	.91	.08	.04
Mixed				
Professional Staff	.98			
Gross Fees	.33	.32		
Net Fees	.31	.31	.97	
SIZE	.999	.99	.33	.31

highest is .98 for the mixed firms. The lowest correlation between the two fee measures is .83 for the architectural firms, and the highest is .99 for the engineers. However, the correlation between either staff measure and either fee measure is far lower for the architectural and engineering firms, ranging from .03 to .33. Since the correlations are performed only for firms which have valid responses for both variables in question, the poor correlation of staff and fees cannot be laid to incomplete responses. The data are simply not consistent for any firm type.

We choose to discard the fee data, and calculate firm size from the staff data alone. In the first place, this gives more than twice the number of complete observations. Second, the gross and net fees were obtained indirectly by asking for the number of assignments completed in each of a number of fee categories. Such a question seems inherently more difficult to answer correctly than questions about the number of people on staff.

In order to utilize the information in both the professional and total staff variables, we have calculated a composite staff measure of size, called SIZE. Based on sketchy information about wage levels for professionals and non-professionals, we estimate that the average professional will receive 50% more than the average non-professional. If total compensation is a proxy for value added, then we can add to the total number of staff 50% of the professional staff, to derive an index of total compensation. Our SIZE variable

is thus total staff plus 0.5 times professional staff. The relationship of SIZE to the other variables is shown in Table III.B.13. Its correlation with total staff is always more than .99, and with professional staff is always more than .87. This means that the variance in professional staff is small relative to that in total staff. The correlation with gross and net fees is low, especially for engineering firms. We assume that this low correlation is a result of inaccurate data on fees, rather than of a fundamentally weak relationship between SIZE and actual fees collected. Elsewhere in this report when the SIZE of firms is referred to, this variable is the basis for measuring size.

b) Size Distribution of Firms

We have established in Section III.B.1 of this report several alternative definitions of markets within which firms can reasonably be said to compete. In Section III.B.2a), we have established a measure of the size of a firm. We can now proceed to determine the market shares or size distribution of firms in various markets using these data. One important caveat must be kept in mind, however, in all of the following discussion of market concentration. We have as a measure of the size of each market only the total size of the firms in our survey. The survey is not a complete survey of all firms that offer these services, and not all firms that were identified have completed the questionnaire. Thus we will in most cases have an estimate of market size that is

smaller than the actual total market. The numerator of the market share fraction will also be subject to possible error, if a missing firm is one of the largest in the market. Thus all estimates of market share should be recognized as estimates only, subject to possibly significant biases.

Table III.B.14 shows the distribution of the SIZE of architectural and engineering firms across Ontario. The mean size of architectural firms is one-half that of engineering firms. In both cases, the smallest firm is a one-man firm. More detailed data indicate that 60% of architectural firms have a SIZE of 5 or less, while 50% of engineering firms are of this SIZE. Less than 8% of architectural firms have a SIZE greater than 20, while 14% of engineering firms are in this category.

If one regarded all of Ontario as a single market, and ignored the fields of practice (which were shown above in fact to be separate product markets), the concentration ratios of Table III.B.15 would result. The four largest architectural firms represent 15% of the SIZE of all architectural firms in the survey. The four largest engineering firms include 10% of the SIZE and the top four mixed firms 41%. If we consider only those firms that do a significant amount of building design, the architectural and mixed figures do not change, but the engineering concentration rises to 14%. Because the mixed firm concentration is so high for this largest market definition, there is no point in analyzing the mixed firms in more detail; any sub-market will be highly

Table III.B.14

SIZE[1] Distribution of Architectural and Engineering Firms

	Architectural Firms	Engineering Firms
Mean SIZE	7.7	14.2
Standard deviation	11.7	29.2
Minimum	1.5	1.5
Maximum	122.	305.
Number of firms	290	683

[1] SIZE = Total staff + .5x professional staff

Table III.B.15

Concentration Ratios: All Ontario

		Four-Firm Concentration Ratio	Number of firms responding
Architectural firms		15%	290
Engineering firms:	all	10%	683
	buildings only	14%	657
Mixed firms		41%	92

concentrated. The rest of this discussion will concern only the architectural and engineering firms.

Since the engineering firms practise in a number of fields that were found to constitute essentially separate markets, it is useful to analyze each of these separately. Table III.B.16 shows the four-firm concentration ratio for engineering firms in each of seventeen fields of practice. The first column includes each firm based solely upon its SIZE. For the second column, the SIZE was multiplied by the percentage of gross billings that are attributed to the field.[16] This can be interpreted not just as the size of the four largest firms that do work in a field, but the activity in that field of those four largest firms. The second column is the more precise measure of concentration in each field.

The concentration ratios in the second column of Table III.B.16 range from 15% to 98%, with most numbers in the range of 30% to 60%. Building design is least concentrated at 15%, and land transportation (#3) is about average at 45%. While the inclusion of firms not in our survey could change individual numbers significantly, they would probably not change the broad range of the results, other than to reduce these ratios somewhat. Comparison of the concentration ratios for the first 2/3 of the responses received with the ratios for the full sample show that the ratios were reduced about 25% in the full sample. The very high numbers among the last five fields may be a little misleading since those fields were written into the "other" category on the questionnaire, and thus

Table III.B.16

Concentration Ratios: Engineering Firms by Field

Field of Practice	Four-Firm Concentration Ratios[a]: Not weighted by activity in the field	Four-Firm Concentration Ratios[a]: Weighted by activity in the field
1. Agriculture, fisheries, forestry and forest products	36	50
2. Air and sea ports, harbours and terminals, coastal works	32	42
3. Bridges, tunnels, highways and railways	26	45
4. Buildings	14	15
5. Dams, irrigation and flood control	44	42
6. Plant process design	23	34
7. Mining and metallurgy	34	27
8. Municipal services	21	23
9. Petroleum & natural gas	47	55
10. Power generation, transmission and distribution	35	58
11. Telecommunications	47	51
12. Urban and regional planning	38	40
13. Other - Transportation	60	69
14. Other - Consulting	97	98
15. Other - Land development	81	77
16. Other - New design	92	95
17. Other - Other	32	35

a. All weighted by firm size.

probably appear more specific than if they were printed on the questionnaire to allow all firms to allocate some of their billings to them if it seemed appropriate.

The examination of geographical markets suggested that either the entire Province or the five postal code letter areas might be reasonably regarded as markets for competitive purposes. Table III.B.17 shows the concentration ratios when the engineering practice in each field is divided into separate geographic markets by postal code. Each entry shows the total activity in a field by the four largest firms located in that code area divided by the total activity in that field by all firms located in that code area. This number can be interpreted as the concentration of the production of consulting services in the code area. Since some work done by a firm might be for a project or client located outside the code area (or outside Ontario) the concentration of work done on projects, or for clients, in the code area might be higher or lower than the figure presented. Our data do not allow us to examine this latter question, but if the code area is in fact the relevant market area, then the import and export of services from each code area should be small.

As would be expected, dividing the Province into five markets greatly increases the firm concentration. The average four-firm ratio over the first 12 fields ranges from a low of 61 in Toronto to a high of 92 in Northern Ontario. It seems likely that the inclusion of firms missing from our survey would lower most of these ratios somewhat.

Table III.B.17

Concentration Ratios: Engineering Firms by Field by Postal Letter
(weighted by % of billings in the field)

Field of Practice / Postal Codes:	K	L	M	N	P
1. Agriculture, fisheries forestry and forest products	60	69	76	68	97
2. Air and sea ports, harbours and terminals, coastal works	90	93	63	98	100
3. Bridges, tunnels, highways and railways	78	76	65	66	91
4. Buildings	44	38	25	24	45
5. Dams, irrigation and flood control	90	69	76	93	100
6. Plant process design	56	61	62	69	99
7. Mining and metallurgy	77	67	39	93	93
8. Municipal services	63	38	49	53	86
9. Petroleum and natural gas	100	62	78	93	100
10. Power generation, transmission and distribution	93	74	73	59	100
11. Telecommunications	89	85	65	100	--
12. Urban and regional planning	75	51	60	50	100
13. Other - Transportation	100	--	99	100	--
14. Other - Consulting	100	--	100	100	--
15. Other - Land development	87	100	--	100	--
16. Other - New design	100	100	100	--	--
17. Other - other	49	51	67	66	97
Average of #1 - #12	76	65	61	72	92

The more limited fields of building design and of transportation can also be divided into five geographical regions. The result is shown in Table III.B.18. The four-firm concentration ratio for architectural firms is lowest in Toronto at 23%, and highest in northern Ontario at 68%. The engineering firms that work in building design are more concentrated in eastern and northern Ontario. These two observations are consistent with our earlier findings that the architectural firms have clustered more in Toronto than have the engineering firms, although the differences shown here are not large. The last column in the Table shows the same information for engineering firms that engage in bridge, tunnel, railway and highway design. In all cases, this practice is significantly more concentrated than building design, ranging from 55% to 91%.

We can also treat each specialty in building design as a separate market, and examine the degree of concentration in each specialty. This is shown in Table III.B.19 for architectural and engineering firms. The list of specialties is the consolidated list from Table III.B.3. The concentration levels shown here are reasonably low, generally running under 40% for architects. The high concentrations among architects are in those activities that are traditionally engineering functions: structures and circulation. The engineering concentrations are higher, but here too the highest values are in areas that are traditionally architectural activities: interiors and furnishings, and landscaping.

The concentration ratios in Table III.B.19 have

Table III.B.18

Concentration Ratios: by Postal Code

First Letter of Postal Code	Architectural Firms	Engineering Firms	
		Building Design	Transportation Design
K	45	44	74
L	34	38	75
M	23	25	59
N	45	24	55
P	68	45	91

Table III.B.19

Concentration Ratios: Building Design by Specialty (Narrow Expertise Definition)[a]

Specialty Activity[b]	Architectural firms	Engineering firms
1. Structures	74	27
2. Circulation	100	50
3. Enclosures	17	32
4. People movement	34	75
5. Acoustics	41	71
6. External appearance	17	60
7. Interiors	19	64
8. Furnishings	28	90
9. Space	19	44
10. Landscapes	29	87
11. Management	39	37

a. The market is defined as all firms claiming a high level of expertise in the specialty.

b. See Table III.B.3 for explanations.

been calculated using a rather strict market definition: only those firms that gave themselves the highest expertise rating (#1) are included. In fact, however, many firms that rated their expertise as #2 may do a substantial amount of work in the specialty, or can easily move into it, if market conditions make this attractive. (Chapter II generally uses ratings of 1 or 2 as an indication of expertise.) We have therefore re-calculated the concentration ratios including firms that rated their expertise at either 1 or 2, and weighting each firm by the percentage of its gross billings in the building field. The results are shown in Table III.B.20. The resulting concentration ratios are only one-half to three-quarters as large as those based on expertise #1, with most of them well below 40%. Thus deciding what degree of expertise qualifies a firm to be counted in a specialty market is important to the magnitude of the concentration that will be measured. Since all the following calculations use the highest level of expertise, they should be recognized as upper estimates of concentration levels.

Next, the geographical and specialty categories can be applied to firms in building design simultaneously, to give the smallest defensible market definition. Table III.B.21 shows the four-firm ratios for architects and engineers separately. Predictably, the concentrations here are higher than when each division is applied alone. Numerous markets have concentration ratios over 90%, especially in specialties traditionally belonging to the other firm type. Postal

Table III.B.20

Concentration Ratios: Building Design by Specialty

Broad Expertise Definition[a]

Specialty Activity[b]	Architectural firms	Engineering firms
1. Structures	25	25
2. Circulation	47	30
3. Enclosures	17	27
4. People movement	29	55
5. Acoustics	29	56
6. External appearance	16	43
7. Interiors	17	52
8. Furnishings	19	51
9. Space	17	30
10. Landscapes	23	54
11. Management	23	37

a. The market is defined as all firms claiming an above-average level of expertise in the specialty: expertise = 1 or 2.

b. See Table III.B.3 for explanation.

Table III.B.21

Concentration Ratios: Building Design - Specialty by Postal Code

Specialty Activity/Postal Letter	K	L	M	N	P
Architects					
1. Structures	100	100	90	--	--
2. Circulation	--	--	100	--	--
3. Enclosures	47	36	28	52	65
4. People movement	72	52	49	80	100
5. Acoustics	100	65	55	100	100
6. External appearance	45	34	25	46	70
7. Interiors	45	40	27	51	65
8. Furnishings	71	64	36	78	100
9. Space	48	39	28	49	68
10. Landscape	94	62	40	88	100
11. Management	64	88	53	100	--
Engineers					
1. Structures	79	67	46	44	85
2. Circulation	90	73	68	55	100
3. Enclosures	84	68	57	39	93
4. People movement	100	100	99	100	100
5. Acoustics	100	100	92	100	--
6. External appearance	97	100	96	46	--
7. Interiors	99	100	100	53	--
8. Furnishings	--	100	100	100	--
9. Space	90	80	53	42	100
10. Landscape	100	100	100	100	--
11. Management	89	74	64	47	89

letter P has numerous 100% entries and numerous cases where no firm of one type practises in the specialty. The high concentrations in areas K and P are partly a result of the small total number of firms of all types in these regions.

c) Market Concentration Treating All Firm Types Together

The above analysis has examined market concentration separately for engineering and architectural firms. This is useful for determining some aspects of the structure of these markets since these two firm types are so distinct, and fall under separate legislative regulation. In many cases, a client will look for only an architectural firm or an engineering firm, and for such clients the relevant market is limited to one firm type.

In some cases, however, a client will want specific services performed and will be indifferent to whether they are performed by an architectural firm, an engineering firm, or a mixed firm. In such cases, the relevant market is all firms of all types that perform the requisite service. It is therefore useful to consider some of the previously discussed concentration measures for a combined set of architectural, engineering and mixed firms. We would expect that the concentration ratios would generally be lower than for any one firm type because of the larger total market size.

Table III.B.22 shows concentration ratios for all firms for several market definitions. Where the market is all of Ontario, and all specialties in building design, the

Table III.B.22

Concentration Ratios: Building Design All Firms[a]

(Architectural, Engineering and Mixed)

Market Definition	Four-Firm Concentration Ratio
All Ontario, all specialties	8
All specialties, by first letter of postal code	
K	27
L	23
M	13
N	19
P	47
All Ontario, by specialty	
1. Structure	15
2. Circulation	29
3. Enclosures	12
4. People movement	27
5. Acoustics	31
6. External appearance	13
7. Interiors	15
8. Furnishings	23
9. Space	13
10. Landscape	21
11. Management	20

a. weighted by the percentage of billings attributable to building design.

four-firm concentration ratio is 8%, below what it was for any firm type alone (see Table III.B.15), and clearly a competitive structure. If the Province is separated into the five regional markets, the ratios range from 13 to 47%, with the Toronto market clearly competitive, and northern Ontario oligopolistic. Separating markets by specialty alone yields ratios from 12 to 31%, which are generally competitive. The highest concentrations are in people movement systems and acoustical systems, which have consistently been high for all market definitions. All of the high numbers that appeared when looking at engineers or architects separately have been eliminated by grouping the three firm types.

Table III.B.23 shows the four-firm concentration ratios for all firms in building design when markets are separated by specialty and by the postal letter of the firm. People movement systems and acoustical systems show the highest concentrations again, with landscaping almost as high. The Toronto market is most competitive, with an average concentration around 30% while northern Ontario is least competitive with six specialties having ratios of 85% or more. For this market definition, the Toronto area could be described as moderately competitive, but the others range from competitive to monopolistic, with a majority of markets in the oligopolistic range. While looking at all firms together has lowered the degree of concentration in most markets, the structure of the markets still allows for some market power, if the division into postal letter and specialty is appropriate.

Table III.B.23

Concentration Ratios: Building Design All Firms
By Specialty and Postal Letter
(architectural, engineering and mixed)

(weighted by % of billings in building)

Specialty	Postal Letter K	L	M	N	P
1. Structures	59	27	23	38	64
2. Circulation	75	68	46	62	100
3. Enclosures	37	23	21	27	54
4. People movement	55	52	39	69	100
5. Acoustics	100	60	45	86	100
6. External appearance	39	27	22	28	63
7. Interiors	44	32	24	33	62
8. Furnishings	73	55	31	57	87
9. Space	40	27	23	28	59
10. Landscape	77	62	32	54	100
11. Management	57	48	34	39	85

d) <u>Summary</u>

This section of the study has examined a number of alternative market definitions, and found that measured concentration ratios vary considerably depending upon which market definition is used. It is difficult to draw firm conclusions from these results because of the absence of a clear guideline to selecting the "right" market definition. Treating the entire Province as a single market, several fields of practice for engineering and mixed firms could be regarded as oligopolistic, including land transportation (bridges, tunnels, highways and railways) with a four-firm concentration for engineering firms of 45%. If each postal code is a separate sub-market, many fields are highly concentrated, including transportation. Building design is the least concentrated field, but if each type of firm is separated and each postal letter is separated, the market ranges from competitive in Toronto to oligopolistic in northern and eastern Ontario. Furthermore, it is important to split building design into various specialty activities.

In the field of building design, if the three firm types are regarded as competing with one another, then it seems safe to say that a competitive structure prevails except in some particular geographic and specialty markets. If, on the other hand, the three firm types must be regarded as operating in separate markets, then there are a number of sub-markets that possess oligopolistic or monopolistic structures. While the number of such non-competitive markets varies

depending upon whether one separates geographical markets or separates specialty markets, they represent a substantial number unless the entire Province is treated as one market.

One caution must be mentioned for interpreting the concentrations by specialty in building design when the specialties consist only of firms that ranked their expertise in a specialty as "1" on a scale of 1 to 4. Many firms, however, ranked their degree of expertise as "2" in several specialties, and these firms would be close substitutes (although not perfect substitutes) for those ranked "1". Thus the degree of concentration by specialties is probably overstated in terms of its behavioural significance.

Two general conclusions may be drawn from this analysis. First, the competitive structure of this industry varies substantially across markets, and for most of the definitions used there will be found competition in many areas, but significant market power in at least a few. Second, if competition between architectural, engineering and mixed firms were precluded, the degree of concentration in most markets would be greatly increased over what would prevail if they compete freely. This second conclusion implies that the regulatory environment under which architects and engineers practise can significantly affect the degree of competition in the provision of these services.

3. Clients

The preceding section of this report described the

structure of the seller's side of the market for architectural and engineering services. This section will describe the structure on the buying side of the market by looking at information about clients of those firms. Two sources of information are available, the questionnaire to the firms themselves, and a survey of clients. We will investigate who are the buyers of professional services, the relationship between client and professional, and how much expertise the clients have in choosing professionals and evaluating their work.

a) Who are the buyers of these services?

The questionnaire of professional firms asked those firms to indicate the percentage of their clients in each of a number of categories. The responses are shown in Table III.B.24 separately for architectural, engineering and mixed firms. The clients of architectural firms are distributed almost evenly among industrial and commercial companies, individuals (some of whom actually represent companies), governments, and real estate development companies. Industrial and commercial companies were the most numerous clients of both the engineering firms and the mixed firms, with governments in second place. Real estate development companies were a close third for mixed firms, and a distant third for engineering firms. Individuals are a small fraction of the clients for all except architectural firms.

In another question, firms that acted as prime

Table III.B.24

Distribution of Client Types

(% of all clients)

Client Type	Architectural Firms	Engineering Firms	Mixed Firms
1. Industrial and commercial companies	22	39	34
2. Real estate development companies	20	14	22
3. Non-profit institutions	10	3	6
4. Government (all levels)	21	22	23
5. Individuals	23	6	7
6. Architecture or engineering firms	3	14	6
7. Other - contractors	<1	1	1
8. -- - mining corporations	0	1	0
9. -- - other	1	2	1
Total	100	100	100

Source: Firm Questionnaire III.2

consultants in building design were asked to indicate the total cost of construction of projects in which they had acted as prime consultants during the last three years, indicating client type and building type. The responses to this question are tabulated in Table II.C.15, 16 and 17, for architects, engineers and mixed firms, respectively. Chapter II analyzes in detail the relationship between prime consultants and clients presented by these data. Several patterns can be seen in these data linking client types to building types. Industrial and commercial companies hire professionals to design primarily retail commercial and industrial buildings. Real estate development companies hire professionals to design commercial and multiple residential buildings. Non-profit institutions hire professionals to design institutional buildings, as do governments. Individuals hire professionals to design single family houses, and while the data also show a non-trivial number of commercial buildings, these may be done for corporate clients represented by a single individual.

Since this question was to be answered by firms acting as prime consultants, no responses were expected in the column showing an architectural or engineering firm as the client. No consistent interpretation has yet been found for the responses actually given here, but it seems that errors must have been made in answering this question. The "other" column shows that most clients were included in the specified client types.

Looking at the three firm types, engineering firms

and mixed firms do the bulk of the industrial buildings for industrial and commercial companies with architectural firms doing most of the commercial retail for those clients. When the clients are real estate development companies, engineering firms are the prime consultants for the majority of the other residential work, while engineers and architects are the prime consultants for about equal values of office commercial and retail commercial design. The similar levels of activity of architects and engineers in the residential and commercial area either indicate the great overlap in the activities of these two professions, or suggest that the data in this table may be erroneous and should be treated cautiously. This is discussed in Chapter II. Architectural firms are prime consultants for the vast majority of the institutional design and the majority of the governmental design, with mixed firms taking second place in government work. Architects also are prime consultants for most of the single family residential design for individuals.

We attempted to determine whether any of the building type categories were related, by calculating correlation coefficients between the construction cost numbers for the row totals from Table II.C.15, 16 and 17. No significant correlations were found, indicating the validity of these categories as separate markets, from a production standpoint.

In addition to surveying the professional firms, we conducted a limited survey of clients of professional firms. Personal interviews were conducted with a few firms,

and then a questionnaire was mailed to the remainder with follow-up telephone calls to clarify any questions that might arise about the questionnaire. Table III.B.25 shows a classification of the clients that were surveyed. For simplicity, we have reduced the number of classifications to five, separating governmental and private sector clients and dividing residential and non-residential buildings. The fifth classification is government purchasing transportation design services. Of the clients shown in the table, the majority have purchased design services for new construction, while a somewhat smaller number have purchased services for renovation of existing buildings.

Table III.B.26 shows the type of building designed for various clients. Each entry in the table shows the number of clients of the specified type purchasing design services for buildings of the specified types. There are few surprises in the table. It is a useful reminder of the diversity of building types that are designed by the architecture and engineering professions.

b) What is the Relationship between Clients and Professionals?

There are many steps from the original conception of a need for a particular building to the final completion and acceptance of the structure. Architects and engineers may be involved in a variety of different ways involving few or many of these steps. The survey of clients asked the extent to which the clients themselves acted as project

Table III.B.25

Classification of Clients Surveyed

Client Type	Number Surveyed
1. Government and non-profit institutions: residential	3
2. Government and non-profit institutions: non-residential	12
3. Private sector: real estate developers and home builders	17
4. Private sector: non-residential	14
5. Government: transportation	3
Total	49

Source: Client Survey

Table III.B.26

Building Types Designed for Clients

(Number of clients mentioning each building type)

Building Type \ Client Type	1 Gov Res	2 Gov Non-Res	3 Private Res	4 Private Non-Res	5 Gov Trans
Single family residential			1		
Multiple residential			2		
Hotel			1	1	
Residential and Commercial	1	1	6		
Other residential mixes	1		4		
Auditorium			1		
Hospital		3			
Classrooms		4			
Other University Buildings		2			
Office Commercial			1	3	
Mixed Use	1		1	2	
Industrial				8	
Transportation facility					3
Other		2			

Source: Client Survey, Question 4.

managers or project co-ordinators rather than hiring professionals for this particular activity.[17] In 40% of the cases, the client himself undertook the role of project co-ordinator and project manager. In less than 30% of the cases, the client was responsible for project co-ordination only while in 22% of the cases the client undertook neither co-ordination nor management. The proportion of clients did not differ markedly among the five client types.

Several reasons were given by clients for undertaking the project co-ordination and/or management.[18] The primary reason was to increase the client's control of the project budget and the timing of the project. In many cases, the stated reason was that the client organization was structured with the capability of project co-ordination and management. This was generally true of real estate development companies which do a substantial volume of business and would generally have their own staff capable of undertaking these functions. Firms that indicated that they undertook project management and co-ordination responsibilities generally expressed satisfaction with their experience in that role. There was no evidence of particular problems created by division of responsibility between the client and the professional.

c) <u>How Knowledgable are Clients?</u>

Since a significant reason for regulating the profession is to protect unsophisticated clients from regulated

practitioners, we made some attempt to ascertain the degree of sophistication of the clients themselves. First, the clients were asked to rate their degree of experience in technical aspects of design and economic aspects of design on a scale ranging from 1 indicating a high level of expertise to 5 indicating a low level of expertise. The results are shown in Table III.B.27. In general, the clients represented here show a high degree of self-confidence in their own expertise. On each question, only one or two clients rated themselves as having the lowest level of expertise. The average level of expertise was slightly better than number 2. Still, a small number of firms gave themselves rankings of 4 and 5 in both questions. Government agencies purchasing transportation design services do not seem significantly different from purchasers of building design services.

Clients were also asked whether they had sufficient information to make a decision about retaining a professional firm.[19] Less than ten per cent of the clients answered "no" to this question. Once again, this demonstrates that at least a small fraction of the clientele feel themselves to be inadequately informed in dealing with professionals.

In an attempt to obtain more objective information about the expertise of clients, two questions were asked relating to the number of projects and years of experience that client decision-makers had in dealing with professional firms, and the number of engineers or architects on the staff of the client. Table III.B.28 lists eleven descriptions that were given of the person who made decisions about retaining

Table III.B.27

Client Evaluation of Own Expertise in Building (or Highway) Design

A. Technical Aspects of Design

Expertise \ Client Type	1 Gov Res	2 Gov Non-Res	3 Private Res	4 Private Non-Res	5 Gov Trans
1 = High	2	4	8	2	2
2	1	6	8	7	0
3	0	1	3	2	1
4	0	1	0	3	0
5 = Low	0	0	1	0	0

B. Economic Aspects of Design

Expertise \ Client Type	1 Gov Res	2 Gov Non-Res	3 Private Res	4 Private Non-Res	5 Gov Trans
1 = High	1	0	12	2	2
2	2	9	4	6	0
3	0	3	1	4	0
4	0	0	0	1	0
5 = Low	0	0	0	1	1

Source: Client Survey, Questions 22 & 23.

Table III.B.28

Client Decision-Makers and Their Experience

Description of Decision-Maker / Client Type	1 Gov Res		2 Gov Non-res		3 Private Res (Bldrs&Dvlprs)		4 Private Non-res		5 Gov Trans	
	A	B	A	B	A	B	A	B	A	B
1. President, principal, Minister	1	75	3	99	12	79	3	14	1	99
2. Senior Executive			1	?	5	63	7	7		
3. Head of operating Department	2	99			1	50	3	69		
4. Staff architect					1	15	1	99		
5. Staff Engineer							3	73		
6. Board of Directors/ Governors	1	99	9	25					2	0
7. Other Committee			2	?						
8. Development team	1	75			1	8				
9. Engineering or Technical Department			2	99			1	20		
0. Project Manager					1	4				
1. Other					1	--				

A = number of decision-makers of this type that were identified
B = average number of projects this decision-maker has been involved in.

The number 99 indicates a response of 99 or greater, or a subjective response indicating a large number of projects.

In some cases the average represents less than all of the decision-makers, if some did not answer the question.

Source:
Client Survey, Questions 14 and 15.

professionals for building design, and their experience. For each client type, column A shows the number of clients that identified that type of decision-maker. Column B shows the average number of projects engaged in by the identified decision-maker. Thus, government agencies engaged in residential construction indicate that the decision-maker is a president, or principal, or the head of an operating department. In both cases the number of projects in which the decision-maker was involved is indicated as being very large. This is consistent with the high self-ranking of expertise levels by these particular clients.

The impressive feature of Table III.B.28 is the large number of projects that most of these decision-makers purport to have been involved in. Out of forty-one identified decision-makers, only nine, or less than 25%, had been involved in less than 10 projects. Only 3 appeared to have no prior experience, representing 7% of the group. Two of these 3 were in the transportation field which raises questions about the high levels of expertise claimed in the preceding table. Aside from transportation, this suggests that the proportion of inexperienced clients dealing with professionals is relatively small.

The response to questions about the number of in-house technical staff are shown in Table III.B.29. Six types of technical persons are indicated in the table. Even if each "yes" response were assumed to represent only one staff person, this table would show an average of 2 technical

Table III.B.29

Client In-House Technical Staff

Type of Technical Person \ Client Type	1 Gov Res	2 Gov Non-Res	3 Private Res	4 Private Non-Res	5 Gov Trans	Total All Clients
	Number of Firms Responding "Yes"					
1. Professional Engineer	2	7	8	5	3	25
2. Non-registered Engineer	0	5	4	3	1	13
3. Engineering Technician	0	5	12	9	1	27
4. Professional Architect	2	6	3	3	2	16
5. Non-registered Architect	1	3	4	2	1	11
6. Architectural Technician	3	6	6	4	2	21
No in-house technical staff	0	3	6	4	0	13

Source:

Client Survey, Question 16.

persons per client. In fact, only 13 of the clients representing 26% had no technical staff. The clients indicated the presence of all six types of technical persons in one firm or another. It should be noted that less than one-half of the technical people are in fact registered architects or engineers, the remainder being either non-registered or technicians. Since the technical staff are not a homogeneous group, it is a little difficult to interpret these results precisely, but it does show that about one-quarter of all clients do not have at their disposal some technical talent with which to perform design services or evaluate the work of outside consultants.

The clients were asked about the functions of their in-house technical staff. Responses indicated that this staff does some design work ranging from developing the basic concept for the building, which most clients indicated was a function of their technical staff, to supervising the final construction, which was a function of only a few. All steps in between were undertaken by the staff of at least a few clients. In general, however, the in-house staff participated more in the early phases of design than in the later phases.

The inside staff were also used to assess the final design or building. More than 70 per cent of the clients used their own staff for this assessment, often supplemented with outside consultants.[20]

We have divided the clients into "informed" and

"uninformed" categories on the basis of their own rating of their technical and economic expertise.[21] The basis for the division was to classify a client as informed if its total expertise score from the two questions were 3 or less. This definition yielded 21 informed in 28 uninformed firms. These labels are not intended to define for regulatory purposes what constitutes an informed client, but to divide the client group rather arbitrarily into two categories of reasonable size so that their characteristics can be compared.

Using this definition of informed and uninformed, we find a significant correlation between being "informed" and having a substantial amount of project experience.[22] Only 16 per cent of the informed clients had decision-makers whose experience included less than 25 previous projects, while 52 per cent of the uninformed clients fell into this category. In fact, only 11 per cent of the informed clients had decision-makers with less than 6 projects under their belts, while 39 per cent of the uninformed fell in this category. A similar relationship was found with the number of years of experience of the primary decision-maker. Among uninformed clients, 50 per cent of the decision-makers had less than 11 years experience while less than 17 per cent of the informed clients fell in this category.

The clients were also asked about the methods that they used to assess the final product of the design professional.[23] Only 14 per cent of the informed clients said that they did not undertake a technical assessment of the final product

while 21 per cent of the uninformed clients gave this response. Thus the uninformed clients not only have less experience in dealing with design professionals, but also appear less diligent in determining the quality of the work done for them. This surprising result might be explained if the uninformed clients were involved in smaller projects on the average, which might not make it worthwhile to undertake a serious review, but our data were insufficient to test this hypothesis. An uninformed client is also likely to have difficulty finding an independent expert to appraise the work done for him.

It must be emphasized again that the client survey does not purport to be a statistically significant sample. We have selected a number of clients by the best available methods, but they are not necessarily statistically representative of all clients of architectural and engineering firms. We are aware, for example, that private individuals are underrepresented at least according to the number of jobs undertaken for private individuals. This clearly biases our results since one would expect that private individuals would be among the least informed clients.

Summarizing the results of the client survey, we find a wide variety of types of clients, and of relationships to architectural and engineering professionals. In general, the clients seem to possess a high degree of experience and expertise. Only a small fraction, perhaps 10 or 20 per cent seem to have particularly low levels of expertise and experience.

Experience seemed lacking in the transportation field, but the number of clients was so small that no statistical significance can be attached to this result. Interestingly, the inexperienced clients do not seem to compensate for this inexperience by more diligently checking the work that is done for them.

The size distribution of jobs undertaken by the firms was also examined, using data from the firm survey. This is relevant to the ability of a client to make an informed choice of consultant, since the larger the job, the more worthwhile it is to gather information and make a careful choice. All firms were asked to indicate the number of jobs undertaken in each of a range of fee categories. Both gross fees and net fees were requested, since they give a somewhat different measure of firm size.

The results are shown in Table III.B.30. Perhaps the most surprising aspect of this table is the large number of small jobs; from 26 to 36 per cent of all jobs for architectural and engineering firms involve a fee of less than $1,000. In fact, for engineering firms, the under-$1,000 category is the largest of all. This suggests either that a large volume of minor technical work, such as drafting is contracted out, or that there is some aberration in the responses to this question. The response rate was relatively low, about 50 per cent, and it is possible that only small firms doing small jobs answered it at all.

To the extent that the data in Table III.B.30 are

Table III.B.30

Size Distribution of Jobs

A. Percentage of Jobs in Various Gross Fee Categories

Gross Fee (000$)	Architectural	Engineering	Mixed
0-1	26	36	20
1-5	24	27	15
5-10	18	12	11
10-25	12	7.8	18
25-50	7.8	5.7	10
50-100	10	4.6	7.5
100-500	1.7	4.6	14.4
500-1000	<1	<1	3.0
1000	<1	1.9	<1
Number of responses	(180)	(430)	(65)

B. Percentage of Jobs in Various Net Fee Categories

Net Fee (000$)	Architectural	Engineering	Mixed
0-1	31	34	8.1
1-5	28	27	12
5-10	14	10	9.4
10-25	15	9.7	22
25-50	5.0	6.4	20
50-100	2.6	4.7	11
100-500	3.0	4.7	17
500-1000	<1	<1	1.0
1000	1.1	2.3	<1
Number of responses	(132)	(279)	(41)

Source: Firm Questionnaire V.1

representative, they indicate many jobs small enough that the client could only afford a modest search for the most appropriate firm. This suggests that the number of uninformed clients may be larger than if the size distribution of jobs was weighted toward large jobs.

4. Product Differentiation

Before analyzing the extent of product differentiation by architectural and engineering firms, it is important to define exactly what this means. According to Caves[24] product differences refer only to physical differences between relatively similar products where buyers can make an exact appraisal of the differences and all buyers make the same appraisal.[25] Product differentiation occurs where there are differences between products which the average buyer is unable to evaluate, or which are evaluated differently by different buyers. Consumer durables are an example of goods where product differentiation is common because it is difficult for the average homeowner to assess the difference in performance among, for example, different makes of washing machines. Furthermore, a characteristic important to one buyer may be unimportant to another. One may feel strongly about performance in washing permanent-press fabrics while another may be concerned about the quantity of hot water used in the average wash cycle. In other cases, there may be no physical difference between the products, but preferences are created in the minds of consumers through

advertising which suggests or implies that differences exist. Thus product differentiation refers not to all products with different characteristics, but only to those with different characteristics when the characteristics are difficult to assess or are assessed differently by different consumers.

There are several possible consequences of product differentiation in a market, as compared to an undifferentiated perfectly competitive market. First, product differentiation allows different prices to be charged for the commodity: all sellers are not forced to the same price as in perfect competition. Second, prices may in some cases be above the perfectly competitive price without inducing buyers to switch, because of a real or imagined preference for the characteristics of the higher priced product. Third, the complexity of the product design and the variation in design among manufacturers makes it difficult even for a highly oligopolistic industry to collude in setting prices. Thus, the presence of product differentiation raises the possibility of sellers charging a price above competitive levels, but makes it more difficult for them to agree to do this in a systematic fashion.[26]

We have seen already that within the practice of engineering there is a substantial degree of specialization by field. Table III.B.1 shows that most firms concentrate their activities in a single field, with only a small amount of activity in a few other fields. If all engineering were the market, each field would be regarded as a different product.

Even within a single field, both architectural and engineering firms tend to specialize in a limited number of services. Table III.B.4 shows that most firms claim expertise in a limited number of specialties, admitting a considerable lack of expertise in some other specialties. Thus if the market is a single field, firms offer somewhat different products through their specialization shown in Table III.B.4. It should not be surprising if we find these product differences leading to product differentiation, since different clients may place different values on expertise in one specialty or another. In short, the complexity of consulting services provides a strong expectation that product differentiation will occur.

In the Client Survey, clients were asked to identify the characteristics that distinguished the various firms with which they were familiar, if such distinctions in fact existed. The number of clients mentioning various characteristics as distinguishing among firms is shown in Table III.B.31. Out of about 27 firms responding, ten identified the reputation of the professional firm in the client's problem area as a characteristic that distinguished it from other firms. In other words, the degree of specialization reported by the firms themselves is echoed by the clients. All firms engaged in building design are not alike, but are distinguishable by the area in which they specialize. While the "problem areas" that were referred to in the client questionnaire are not necessarily the same as the

Table III.B.31

Distinguishing Characteristics of Professional Firms (as reported by clients)

Characteristic	No. of Clients Mentioning
Reputation in particular problem area	12
Personal service of senior professional	11
Reputation for completion within budget	11
Reputation for completion on time	10
Size of fee	10
Proposal	10
Reputation for design quality	9
Size of firm	9
Expertise of staff	9
Previous experience with firm	8
Compatibility with client	7
Specialized capabilities	7
Geographic location	4

Source: Client Survey, Question 11.

specialties referred to in the firm questionnaire, the principle remains that firms are distinguished by the work that they do well.

The second most frequently mentioned characteristic was personal service of a senior professional. This emphasizes the difference between service industries and product industries, since personal relationships can be far more important in the former than in the latter. Different clients will evaluate the personal characteristics of senior professionals differently, so this characteristic alone is strong evidence of product differentiation. This is consistent with Scherer's assertion that non-standardized personal services are a common example of product differentiation.[27] One important feature of the results shown in Table III.B.31 is the diversity of characteristics regarded as important by different clients. Less than half of all clients mentioned any single characteristic as being important, and more than 12 characteristics were mentioned by over 10% of all clients responding. This suggests that clients do in fact regard firms as different from one another. In addition, different clients see different characteristics as important in distinguishing those firms. Thus the data in this table seem to be entirely consistent with a market not only of product differences but of product differentiation.

Another means of evaluating the degree of product differentiation is to consider the relationship between fees paid and the quality of work done. Clients were asked

about the strength of this relationship, and while 13 replied that they thought that higher fees necessarily meant better work, 33 said that they thought this was not the case.[28] In other words, over 70% of all clients surveyed believed that there were variations in quality that were not attributable to variations in the fee charged. This description is inconsistent with a perfectly competitive market. It is, however, consistent with a market of product differentiation, where some firms can charge an above competitive price without inducing their clients to switch.

A related question asks whether clients were aware of significant quality differences among professional firms.[29] Forty-one of forty-nine responses to that question stated that such quality differences did exist. The response to this question taken together with the previous response to the question about a fee-quality relationship suggests that clients see this market as characterized by variation in quality that are not explained by variations in fees.

All of the evidence therefore points to the existence of substantial product differentiation in the markets for professional architectural and engineering services. Two implications follow from this. First, some firms will be able to charge a price above the "competitive" price. This means that there is a greater than normal profit in some cases. These higher profits would probably be earned from less informed clients.

It also means that it is difficult for firms in

this industry to collude in setting prices. This would be particularly true in the absence of any published fee schedules. Even where the fee schedules exist, however, product differentiation means that many jobs will not fit precisely into the formulas of the fee schedules, and it would be difficult to demonstrate precisely the amount of deviation from the fee schedule in any particular bid. This limits the profits that might be generated through a high degree of market concentration or the agreement on a fee schedule if the industry were characterized by a single undifferentiated product. In short, the product differentiation observed here limits somewhat the ability of the firms or their associations to exercise control over price. It is impossible to determine the net effect of these two forces.

5. Entry Conditions

Barriers to entry into an industry are an important indication of the possibility for the appearance of potential rivals. If barriers to the entry of new individuals or firms are small or nonexistent, then any price which results in more than average profits will attract new firms into the industry which will expand the supply until price is driven down to a level yielding only ordinary profits.[30]

Three traditional barriers to the entry of new rivals in an industry are economies of scale, established product differentiation, and absolute cost advantages.[31] The first two are potentially relevant for professional practice.

It is possible that economies of scale exist whereby a large professional firm can work more efficiently than a small one. It is also possible that established product differentiation is important; the reputation of the professional firm may be an important factor in firm selection, so that a new firm would require substantial time and expense to develop the reputation that would allow it to compete favourably. Absolute cost advantages are not relevant to professional practice, since this category generally refers to natural resources such as owning a deposit of high quality low cost ore, holding of an important patent, or the cost of acquiring massive capital for a new firm. We will add a fourth category, regulatory barriers. It is possible that the self-regulation of the profession has created artificial barriers to entry and practice that allow existing practitioners to charge higher than competitive rates.

Finally, we must separate barriers to the entry of professionals into practise, and barriers to the entry of new firms into practice. Competition in professional practice might be reduced simply by limiting the numbers of persons who were eligible to participate in that practice. On the other hand, even if the supply of those eligible to practice was large, restrictive factors might operate on the firms into which these practitioners organize themselves that would leave some barriers to the entry of additional firms. These two issues will be considered separately.

a) Barriers to Individual Practice

The practice of architecture by non-architects is prohibited under section 16 of the Ontario Architects Act. That section prohibits anyone who is not a member of the Ontario Architects Association from applying to himself the term "architect" or holding himself out as an architect, or preparing for a fee a sketch, drawing or specification of a proposed building, structure or structural alteration when the work would cost more than $10,000.[32] The important requirement for becoming a member of the OAA is passing the examinations of the registration board.[33] This requirement in turn means completing a five-year course of study in an approved school of architecture, completing three years of work experience of which one year may be accumulated before the completion of the university degree; and the registration course component which requires that the applicant enrol in the OAA's registration course, and pass its examinations.

These requirements for entry into professional practice have been little changed since 1935.[34] There is no evidence that the requirements have been manipulated in the short-run to reduce the rate of new qualifications in times of economic distress. There is, however, a feedback mechanism through the work experience requirement. When conditions in the architecture profession are depressed, there is little work available, and it may be difficult for recent university graduates to find jobs which will give them the necessary two and three years of work experience.

This is not a matter of deliberate policy, but a working of economic forces that may tend to adjust the supply of architects to the demand for them.

During the 1970's schools of architecture opened at Carleton and Waterloo. There is concern in the profession that these schools, combined with the University of Toronto, are producing graduates at a rate greater than the profession can absorb them, particularly in today's depressed market condition. Despite this, each school has at least 10 times as many applicants as they can admit into their program.[35] Several of the individual architects interviewed indicated a desire for the profession to control the number of architects graduating from university. This seemed to be motivated in part by a concern for the plight of students being prepared for a professional practice in numbers so great that many of them may not obtain employment for that practice. There is a danger, however, that such power would be used to protect the present practitioners from competition by potential new members in the field.

It may be that university students are quite prepared to take the risks of a high unemployment rate in order for the opportunity to enter into a very attractive profession. It is also possible, however, that students are not well informed about the job prospects awaiting them upon graduation. It might be useful therefore to set up some formal communication between the professional body and undergraduates who indicate an interest in architecture whereby objective information about employment and unemployment rates in the

profession could be communicated to students. This would at least provide students with an additional source of information to use in making career decisions.

In order to practise engineering in Ontario, it is necessary either that the individual residing or working in Ontario be a registered member of the APEO or, in the case of a partnership or corporation, that body must hold a certificate of authorization issued by the APEO. Registration for membership in the APEO requires among other things that the applicant has passed the professional engineering examinations or been exempted from them, and has accumulated six years of work experience. Exemption from the APEO examinations is granted for applicants who have completed a degree in engineering at a university program accredited by the APEO.[36] In fact, most new members come in through the university program rather than taking the examinations. Furthermore, graduates of accredited universities may be granted an exemption for up to four years of the six-year work experience requirements. In some cases, a further one-year exemption may be granted for a masters degree.[37] Thus the typical applicant has completed a four-year B.A. degree at an accredited university, and has completed two years of work experience.

It appears that the APEO exercises even less control over the number of new entrants into the profession than has the OAA over the number of architects, since most applicants do not, in fact, take the APEO examinations. There is no

evidence that the accreditation of universities or other aspects of the registration requirements have been adjusted or manipulated to limit the supply of new practitioners. It seems reasonable to expect that the same automatic mechanism of poor employment conditions leading to difficulty in completing the work experience may operate for engineering as it does for architecture, but we have no direct evidence of this.

In the cases of architecture and of engineering, the professional bodies have the power to adjust the number of new practitioners, although this power appears not to be widely exercised. The primary question with respect to barriers to entry then is whether the existing registration requirements are more than is necessary to ensure a competent level of practice. The other side of this question, whether the current requirements are less than necessary to ensure competent practice, will be dealt with elsewhere.

There is no simple methodology that can be applied to determining whether the education and practical experience requirements are adequate or excessive for protecting the public from the practice of architecture or engineering by those with insufficient skills. There is no developed theory on this subject and little data with which to work. Interviews with engineering firms included questions about the preparation of new practitioners. Opinion was mixed, ranging from excellent to useless, but the majority of those interviewed indicated that current engineering education was adequate, but that a training period of a few years was

necessary before the new professional was really productive. There were some suggestions that more university courses should be taught by practitioners (rather than professors) and that courses should have a more practical orientation. Other suggestions were conflicting and mixed.

Similar interviews with senior architects yielded the general impression that university graduates in architecture were poorly trained. The major deficiencies noted were that the training was not sufficiently technical, practical or realistic.[38] Some viewed the recent emphasis on philosophy and social issues as a waste of time, while others thought it was necessary. Many suggested that there should be a greater emphasis on technical and practical aspects of architecture, while some simply called for a general improvement and upgrading of standards. In contrast to the senior professionals, junior architects were somewhat more enthusiastic about the educational system, rating it on the whole fairly good.[39] Again, this was an indication that there should be more emphasis on the technical side of university training.

Views on the OAA registration course were also mixed. Senior professionals regarded the OAA registration course rather positively, either because of its value as a learning experience or its importance in setting a standard.[40] Generally those who had called for more practical training in the university took a more positive view of the registration course. The response of junior professionals to the regis-

tration course was, on the average, good. Junior professionals criticized the registration course, some for being too strict, others for being too lenient, and others because they felt that consistent standards were not applied. However, most seemed to regard it as necessary to provide a minimum standard. Some were particularly concerned about evaluating immigrant architects. They seemed satisfied that the quantity of education and training required was satisfactory to ensure an adequate standard of practice.[41]

Summarizing the interviews with practitioners in building design then there is some argument about the proper content of both university courses and professional courses and examinations. There is some concern, particularly in architecture, about the quality of university education. There seems to be general agreement, however, that the duration of the training period, including both university education and practical experience, is about right. Certainly there is no concensus that the burden of the entry requirements for either profession should be increased or decreased. There is no concensus that the proportion of schooling and practical training should be changed, although there was some opinion in the architecture profession that practical training might be more useful than university training.

Another possible source of information about the adequacy of the registration requirements is the interviews with the clients. If the registration requirements are not sufficiently rigorous, we might find substantial client complaints

about incompetent practice. The relationship is not a strong one, however, since there is no guarantee of continuing competence in present registration procedures, and a large portion of all practitioners are many years past their registration. In fact, 15 out of 34 clients interviewed indicated that at some time they had had "major problems in past involvements in building designs such as quality of design work, negotiation of fees, co-ordination of design, etc.".[42] About half of the problems involved what were described as design errors and omissions, while the rest were equally divided among exceeding the cost or time agreed upon, co-ordination problems or problems of being charged a fee larger than the services were worth. The frequency of problems seemed similar for informed and uninformed clients, and for architects and engineers. The majority of these problems were solved by the client correcting the problem, although a substantial number of uninformed clients resolved the problem by negotiation, while the informed client tended more toward litigation. Most clients were ultimately satisfied with the resolution of their problems.

It is difficult to interpret this information about problems encountered with any degree of profundity. While a substantial proportion of the clients experienced problems, it was not clear that the number of problems was large in relation to the number of jobs performed. Furthermore, in many cases the clients indicated that they felt the problems were normal ones that would be associated with human error in

complicated dealings. Overall, we did not get the impression that there was a high level of dissatisfaction on the part of clients with regard to the general level of professional performance. The information gathered for this study does not suggest that current levels of preparation for practice are less than sufficient.

Suppose, on the other hand, that the entry requirements were too strict: that the requirements of university education, and practical experience were more stringent than necessary to ensure a competent level of professional practice in one or the other profession. How great would be the economic harm that was caused? The effect of excessive requirements would be to reduce the supply of practitioners, raise their training costs, therefore raising both the compensation they demanded for reimbursement of their preparation expenses, and the opportunities for gathering additional rents due to restricted supply.

These forces, however, operate primarily upon the sole practitioner. In a firm of any substantial size, professionals and paraprofessionals work together to produce the final product. If the training requirement for professionals is greater than necessary to produce an adequate level of practice, the firm is free to use more paraprofessionals, whose training is less extensive and therefore less expensive. The firm must have professionals who deal with the client and approve or supervise the work done by the paraprofessionals, but it is clear that firms in both professions

exercise a wide degree of latitude in assigning tasks to professionals and paraprofessionals. This substitutability between the two classes of employees in a firm should mitigate the extra costs that might be imposed by an overly stringent professional registration requirement. So long as the supply of paraprofessionals is not restricted, and their scope of work in association with professionals is not restricted, the harm that might be caused by excessive registration requirements for professionals seems small. If unusually high incomes or rents are generated for the professionals, firms will tend to substitute paraprofessionals so long as this substitution drives down those rents and the total costs of production. While the paraprofessional will have no ability to gather rents, so long as the supply is highly elastic, substitutability of professionals with paraprofessionals limits the rents of the professionals themselves.

In summary, the barriers to the entry of individuals into professional practice are primarily the cost and time required for a university education and two or three years of practical experience. There is no evidence that these requirements are manipulated in the short-run artificially to restrict the number of practitioners. While it is difficult to assess the requirements absolutely, there is little evidence that they are either excessive or insufficient. Finally, because much of the actual professional practice of architecture and engineering is in firms employing both professionals and paraprofessionals, the substitutability of

paraprofessionals for professionals limits the possible economic cost that might be associated with excessive professional practice requirements.

b) Barriers to the Entry of New Firms

We consider now the barriers to the entry of the practising unit which will be referred to as a firm although it may be an incorporated body or a partnership or even a sole proprietorship. Barriers will be considered under two headings: product differentiation or reputation and economies of scale.

Clearly if the reputation of a firm is an important factor in selecting a firm, then a newly established firm will require some investment in promotional activity: taking jobs at less than competitive prices, submitting proposals, making contacts or simply waiting before it can establish a reputation. The established reputations of firms in the industry then constitute a barrier to the entry of a new firm. In fact, reputation and experience are quite important in the selection of professional firms. Table III.B.32 shows that of 63 responses by architectural firms to questions about the basis for firm selection, there were 9 mentions of referrals from previous clients, 9 mentions of quality of previous work and 8 of reputation. Thus over one-third of the reasons mentioned involve factors that could only be accumulated through experience. Ten mentions were given of interviews and presentations which are available equally to new

Table III.B.32

Client Reasons for Choosing Architectural Firms
(as stated by architects)

Reasons	Number of times mentioned
Personal acquaintence	11
Interviews and presentations	10
Referrals from previous clients	9
Quality of previous work	9
Reputation	8
Expertise in specific fields	7
Political factors	4
Fees quoted	3
Proximity	2
Total	63

Source: Architecture Interviews, p.22

and old firms, and are therefore an effective means of promotion for the new firm.

Table III.B.33 shows what engineering firms regarded as the important characteristics of firms perceived by their clients. The first column represents firms that do over 50 per cent of their work with architects; the second column is all other firms. Reputation and experience in the client's area are both at the top of the list, and are factors which would be available only to an existing firm. In fact, there is very little in the engineering list of characteristics that would be available to a new firm.

The statements of the professional firms about the characteristics that are important to clients may be compared with the statements made by clients in the client survey about the distinguishing characteristic that they regard important in professional firms. The clients were asked to rank a set of criteria according to the importance that they place on these criteria when deciding to retain a firm offering building design services. Table III.B.34 shows the response to that question. The reputation of the firm is divided into four categories: reputation for finishing on time, for finishing within the budget, for experience with past jobs in this problem area, and reputation for quality in building design. These four aspects of reputation ranked very highly among the clients as decisive factors in choosing a firm. Another important factor was the client's previous experience with a particular firm, the range of expertise of the staff, and personal service from a senior professional.

Table III.B.33

Client Reasons for Choosing Engineering Firms
(as stated by engineers)

Reason	Number of times mentioned by: Firms working for architects[a)] (9 firms)	Firms working for non-architects (11 firms)
Reputation	5	5
Experience in specific areas	5	4
Meeting time constraints	6	4
Meeting cost constraints	2	4
Size of firm	1	0
Service from senior professional	1	1
Depth of staff	1	0
Compatibility with client	1	1
Satisfactory service	0	2
Practical and flexible	1	0
Control over consultant	2	0
Trust	0	1
Quality of design	1	1
Personal contacts	1	0
Political decision	1	0

a) In this column the client might be an architectural firm or the building owner.

Source: Engineering Interviews, p.12

Table III.B.34

Client Ranking of Criteria for Choosing a Firm

	Criteria	Score[a]	Ranking
1.	Reputation - finish on time	6.8	3
2.	Reputation - finish in budget	6.4	2
3.	Reputation - experience in this problem	8.7	7
4.	Reputation - quality design	5.1	1
5.	Size of firm	11.2	10
6.	Range of expertise of staff	7.5	5
7.	Personal service of senior professional	7.6	6
8.	Specialized capabilities	11.5	11
9.	Compatibility with own organization	8.7	8
10.	Proposal	12.6	13
11.	Fee	11.0	9
12.	References from prime consultant	15.3	15
13.	References from other firms in bldg. design	15.7	16
14.	References from other organizations.	11.9	12
15.	Geographic area	12.7	14
16.	Previous experience with firm	7.4	4
17.	Political Decision	16.3	17
18.	Other	19.0	18

[a] A smaller number implies greater importance.

Source: Client Survey, question 10.

On the other hand, it is interesting to note that geographic location was not regarded as an important factor by the client. This would tend to suggest that clients are not often forced to choose a firm primarily because of its proximity of location. Either this implies that the geographic markets are widespread or that there is a sufficient selection within a small geographic area so that the choice is not severely restricted. In either case, it can be taken as indicating the reasonable degree of competition in this market.

Because the responses of the firms and the clients were of a rather different type, it is difficult to say whether they are consistent or not. In Table III.B.33, the firms list personal acquaintance as an important factor. This might be interpreted as criterion number 7 in Table III.B.34, personal service from senior professional, or it might even be interpreted as a factor in developing the reputation of the firm in any of the first four criteria. The first four factors in Table III.B.33 (engineering interviews) are very similar to the first four criteria in Table III.B.34 suggesting that these are consistent as far as these particular aspects of reputation are concerned. Only quality of design ranks low among the engineering firms and high among clients. Personal acquaintance is ranked high by the architectural firms, but low by the engineers and low by the clients.

In summary, there seems to be a substantial area of

agreement between the firm and client surveys on the matter of choosing a professional firm. More important, the reputation of the firm is of paramount importance. This would raise obvious difficulties for the professional who had just been registered and wished to establish his own practice.

It is clear from the above that an individual who had just registered with the OAA would have some difficulty in establishing a practice of his own. It appears that an individual who had just registered with the APEO would face almost insurmountable difficulties in beginning practice on his own. Thus the barriers to the entry of new firms staffed entirely by new practitioners are substantial in architecture and almost overwhelming in engineering.

Probably for this reason it is far more common for firms to be established by practitioners with some existing experience. While hard data are not available, the interviews suggest that in the engineering profession it is not uncommon for individuals to practise with an existing firm for a period of time and then to split off to form their own firm. When this route is taken, the individual or individuals who split off from the existing firm will hope to take with them a number of clients of the parent firm. In addition, those individuals have substantial experience on a personal basis which provides the new firm with the reputation needed to establish itself. While in architecture the barriers to the novice practitioner seem less formidable, and it is somewhat more common for an individual to set up his own

practice immediately upon registration, the same mechanism of individuals splitting off from an existing firm is probably the easiest method of formation of new firms.

When viewed in this way, the barriers to the entry of new firms seem rather modest. If existing firms began to earn above average profits, these profits would generally be absorbed by the partners in the firm, and not distributed to all employees. (If they were fully distributed, there would no longer be profits but high wages.) Staff members who did not enjoy a share of these profits would have an incentive to split off and form their own firm so that they could begin to enjoy the extra income associated with financial investment in the firm. This process of division could be expected to continue until the excess profit had been driven below the threshold of the costs associated with the division and establishment of a new firm. In short, so long as there is an adequate supply of practitioners, it seems likely that the barrier to the entry of new firms will be small.

It is worth considering briefly the role of advertising at this point. Advertising is usually regarded as a barrier to the entry of new firms. But the absence of advertising may also make it difficult for a small firm and a small client to get together.[43] An old large firm will be well known by clients, and large clients are sufficiently well known that they may be pursued by any firm in search of business. Small clients, however, are not identifiable and

without advertising a small firm may not be able to locate them. Presently both professions allow advertising so long as it is in good taste and factually accurate.[44] In the case of architecture, the previous prohibition against competing on the basis of fees would presumably prohibit advertising of fees. In the case of engineering, a code of ethics provides some further limitations on advertising intended to avoid attacks on other professionals and misleading advertising. It thus appears not to be the practice to advertise fees.

The other barrier to the entry of new firms might be the existence of economies of scale in the practice of either architecture or engineering. In manufacturing, economies of scale are frequently a barrier to entry, particularly in the context of the limited Canadian markets. Engineering and architectural services, however, are not a homogeneous commodity like refrigerators or automobiles, but rather a very heterogeneous commodity. A very wide variety of services are offered by different firms in both professions. Thus, if a large firm is necessary to offer a full range of services, or some particularly complex services, a small firm may specialize in a particular type of building, a particular type of client or a particular type of service and operate quite efficiently.

The firm questionnaire data on firm size show that over 80 per cent of all architectural firms have a SIZE less than 10, while over 70 per cent of all engineering firms are in

this SIZE category. These firms would average four or less professional staff. Looking only at firms engaged in building design, and separating each of the 10 specialties, we find that for both architects and engineers, the average SIZE of all firms except the four largest in the specialty is less than 12. Thus all specialties include some firms with a relatively small SIZE, and with four professionals or less. It does not appear from this evidence that any building specialty involves economies of scale that preclude the operation of a firm with only four professionals.

Additional information is available from the firm interviews. The principals of architectural firms indicated generally that they felt that their firm size was advantageous, although that firm size ranged from one-man firms to very large firms.[45] It did not appear that principals of firms of any size felt that they were at a disadvantage because of their size. It appears as if firm size is dictated by the tastes of the principals and the desired degree of specialization rather than by market forces alone.

One explanation for this lack of indivisibility is that it is possible to hire most of the skills required for conducting either an architectural or an engineering practice when those skills are needed. Freelance operators or small specialized firms provide most of the functions that are carried out by a large firm. Thus a small firm can survive without a draftsman and hire a drafting service, or without some professional specialty and hire that specialty when the need arises. In short, the market for the inputs to practice

seems to work sufficiently well that those inputs need not be gathered together under a single roof. The architectural principals indicated that they, in fact, hire numerous specialists when the need arises.[46] While there are problems with quality control in this use of temporary specialists, it appears to work reasonably well.

In summary then we find the primary barriers to entry into the professional practice for individuals are the requirements for professional registration and for firms are the need to develop a reputation. This does not seem to be an important constraint on the competitiveness of the market for professional services at present.

C. MARKET CONDUCT

1. Selling Practices, Marketing, The Search Process

When examining the operation of a market, it would seem important to consider the procedures by which the market establishes itself. Specifically, it would be interesting to see how the product is presented by sellers and how sellers are sought and examined by buyers. This section will explore how firms advertise and present themselves and how clients select among firms. We recognize Caves' warning that it is difficult to make welfare interpretations from selling conduct.[47] Still, we can look for evidence of practices that would exclude new firms from competing in the market, would impede the flow of information to clients, would constitute predatory practices by one firm upon another or would otherwise lead to inefficient market operation.

Advertising is a widespread if limited means of providing information about architectural and engineering firms. The OAA prohibits advertising based on fees, and prohibits self-laudatory, exaggerated or misleading publicity but allows factual presentations of information.[48] One can observe small ads in the business sections of major newspapers identifying the architectural firm and perhaps mentioning specialties. The name of the architect is frequently displayed prominently on a sign at the building site. In the yellow pages, architects are merely listed. It appears that clients are solicited only when there is some indication that the client is in need of architectural services. This solicitation may take the form of phone calls, letters, and brochures.[49] Many firms have available a brochure which describes the specialties of the firm, its strengths and major projects.

Engineering firms are free to advertise in a factual manner subject to the bounds of good taste and restraint. The APEO publishes a pamphlet describing the approved style of advertising for engineering firms. Letterheads, newspaper and magazine advertisements, and telephone directory advertisements are allowed but may only include the information approved for business cards which provide: the name, address and telephone number of the practitioner, his degrees and titles, his professional organization membership, his engineering or scientific society membership, the specialties in which he engages and the date of founding of the firm. Small advertisements of this sort may be found frequently in the business

pages and the yellow pages. Signs on a job site or on the office are limited to identification of the practitioner. An important form of advertising is the brochure which goes beyond the business card information to allow photographs, illustrations and technical information "necessary to enable the prospective client to judge the experience, the capability of the engineer and his organization".[50] These brochures may be sent to prospective clients, but are not to be distributed wholesale to the public at large. The CEO directory is also a source of information on engineering firms. In none of the above advertising would the mention of fees seem appropriate.

The interviews with architectural and engineering firms give an idea of the way in which potential firms are identified by would-be clients and the way in which the selection process proceeds. Table III.B.32 in the preceding section shows that in 11 cases personal acquaintance between the client and the firm was a factor in a firm securing a commission. Referrals from previous clients were mentioned 9 times. Reputation was mentioned 8 times. Thus, in a number of cases, the potential client will be able to draw up a list of firms based upon information other than advertising. The firms interviewed suggested that about half of their business was repeat business from previous clients, so that establishing a good continuing relationship is very important for architectural firms.[51] Repeat business formed a larger proportion of the total for large firms than

for small firms indicating a reliance by small firms on a succession of small clients. Furthermore, the firms indicated that a substantial percentage of their clients compared architects systematically before making a choice. This systematic comparison was most common with municipalities, schools, and other institutions.

Here it should be noted that in many cases the client for an engineering firm and in fewer cases for an architectural firm will be another professional firm. Architectural firms are usually associated with structural, mechanical and electrical engineers for most projects. Traditionally, the architect selects the engineers,[52] although increasingly firm selection is influenced by the client or others. Each architectural firm will work with a small number of engineering firms, indicating that there tends to be a continuing relationship between these firms. It should also be noted that a few architectural firms are associated with other firms in related areas, such as development companies, in which the client's selection of an architect would be an internal matter rather than an arms-length transaction.

Some architectural firms have complained about the awarding of municipal and governmental contracts to architects, suggesting that the relationships between a government and particular architects may be sufficiently close that it is difficult for new firms to break into this segment of the market.[53] On the other hand, some municipalities apparently have a practice of "spreading the work around": giving the jobs to different firms over time. It has not been possible

to assess the relative importance of these two phenomena.

Many engineering firms that work on buildings have an architectural firm as a client. Of the firms interviewed, about half did more than 50 per cent of their business with architects and half did less. On the average, the firms dealing with architects reported that 66 per cent of their business was repeat business. Of those doing less than half of their business with architects, only 44 per cent of their business on average was repeat. There were, however, large variations from one firm to another with the proportion of repeat business ranging from 15 to 90 per cent. The majority of engineering firms reported that new clients came to them by word of mouth while just under half reported some advertising activity.

Firms engaged in highway design reported a much higher proportion of repeat business ranging from 70 to 90 per cent. This is probably in part a result of the smaller number of clients who want highways designed than the clients who want buildings designed, although it might also reflect an "old boy network" which had been mentioned by the architects.[54]

It appears that many potential clients will attempt to draw up a short list of possible firms to deal with based upon their past experience, discussions with other clients, and word of mouth information about the reputation of firms. Discussions with these firms will lead to a request for proposals from some if not all of them. In some cases the

fees may be specified in the proposal, while in others they may not be discussed until after a "winning" proposal has been selected. In the latter case, if the fee is not satisfactory, the next leading proposal may be selected.

There are apparently occasional complaints about firms offering services at less than the appropriate fee schedule, usually made by a competing firm. Some complaints have been expressed about U.S. firms doing work in Ontario at less than the approved fees. There is no evidence of serious predatory practices such as price cutting in an attempt to drive a competitor out of business so that prices can be raised. This is not surprising given the low barriers to entry that were observed earlier.

The survey of clients generally confirmed the impression suggested above about the process of selecting a consultant. When asked whether their choice of consultants began with drawing up a list of possible consultants and choosing from that list, 34 clients responded "yes" as shown in Table III.C.1. Of the firms that responded "no", 9 said that they chose the consultant based upon their past experience with that consultant. One stated that they based their choice upon the competence of the consultant without explaining how that competence had been discovered.

The clients were then asked to describe the source for the list of possible consultants. The results are shown in Table III.C.2. Twelve stated that their list came by references from other client organizations. Five received

Table III.C.1

Was the Consultant Chosen from a List?

Response	Number of Clients
Yes	34
No - based on past experience with the consultant	9
No - based on competence of consultant	1
No - other	2
	46

Source: Client Survey, Question 8.

Table III.C.2

Source of List of Possible Consultants

Response	Number of Clients Mentioning Source
Reference from other Organizations	12
Professional Bodies: APEO, OAA, CEO	5
References from other firms offering building design services	4
Recommendation of prime consultant	7
Based on building type	11
Past experience with consultant	8
Consultant approached client	6
Other	2

Source: Client Survey, Question 9.

information from the professional organizations. Four received recommendations from other firms offering building design services. Seven derived lists from the recommendations of prime consultants. In eight cases, past experience with the consultant was the basis for preparing the lists. In six cases the consultants approached the client in sufficient numbers to provide a list. The number of mentions exceeds the number of clients since many indicated that several of the above methods were used in preparing their lists.

Two separate sections above have discussed the criteria which clients regard as important in choosing among possible consultants. That discussion indicated that the reputation of a firm for on-time performance, for performance within budget and for quality in building design was regarded as quite important. Previous experience of the client with the firm or a senior professional also plays an important role in many cases. Finally, the fee to be charged is not a negligible factor in a substantial number of decisions.

One related issue is the market area. It has been suggested during interviews with firms that some of the large firms may expand the geographical area over which they compete for jobs in difficult economic times and contract it during prosperity. In this way, they tend to even out their work load over the business cycle, while small firms' business may fluctuate even more than the total amount of building activity. It has not been possible to gather further information to confirm or deny this suggestion.

In summary, the marketing process seems to be somewhat informal but reasonably efficient. Advertising plays a role here but not a large one. Established reputations and previous work seem to be quite important. We have not heard serious complaints from clients regarding this process.

2. Pricing

We can look to the method of price determination in the practice of architecture and engineering for behavioural clues as to the competitiveness of the industry. Three rather simple pricing models exist for comparison: pure competition, pure monopoly, and oligopoly. In a purely competitive environment, with a large number of firms producing a homogeneous product, the individual firm has virtually no freedom of choice. The price is set by industry-wide supply and demand for the product. Since the product is homogeneous there is no reason to advertise and thus no marketing strategy is necessary. A firm that charges less than the market price will sell all it can produce, but incur losses, while a firm charging more than the market price will sell nothing. Thus, a firm in a competitive market is a pure price taker.

Under monopoly, a profit maximizing firm is in a much happier position but still needs little thought to establish its pricing strategy. The monopolist can charge a variety of prices, and at each price will sell quantities determined by the demand curve. Once the demand curve is known, the profit maximizing price can be determined, and

this is the only price at which a profit maximizing monopolist will wish to operate. Thus, except for responding to changing market conditions or non-profit incentives, we should find a monopolist stably settled at a single high price earning substantial monopoly profits.

It is only in the oligopoly situation that price setting becomes very complicated. By definition an oligopoly consists of a small number of firms who recognize the interdependence of their marketing decisions. Each firm realizes that if it initiates a price reduction, the other firms may follow with matching price reductions leaving all firms at the same market shares but with lower prices and profit. If a firm raises its prices, the other firms may or may not follow, depending upon the condition of the industry and the pricing pattern being followed. Thus, any pricing decision made by a firm will necessarily involve serious consideration of how the other firms will respond.

When oligopolists recognize their mutual interdependence, they will also recognize the desirability of coordinating their price moves so that competition does not unnecessarily arise.[55] Thus, oligopolists may engage in formal agreements about price levels, they may follow a price leadership strategy in which one firm establishes the market price that is respected by others, or they may engage in tacit collusion in which relatively stable prices are maintained without formal agreements or obvious price leadership because the firms have come to an unspoken understanding.

In the United States and in Canada there have been several anti-trust and anti-combines cases prosecuted against industries for price fixing where published price lists were used. A typical case would be one in which a trade association required all members to report the prices at which they were selling their goods, and these prices and sales quantities would be distributed in a frequent newsletter to members of the association. Even where there was not a formal agreement to set identical prices, this price exchange behaviour has been regarded as price fixing in the United States. If association members merely presented their list prices but did not provide information on actual transactions prices, price fixing convictions are less likely. In the Canadian Fine Papers case[56] numerous paper companies were convicted of price fixing in a situation where they had established a uniform price schedule and had an enforcement mechanism for ensuring that the paper mills adhered to their prices and that paper merchants dealt only with mills that were members of the cartel.

Both the OAA and the APEO have maintained fee schedules specifying the minimum rates to be charged for work of various types. There have been, in the past, varying efforts to induce members not to charge less than these schedules. This was legal until July 1, 1976 because services were not covered by the Combines Act until that point. As of July 1, 1976, however, all services, including both architectural and engineering services, seem to be subject to section 32 of

the Combines Investigation Act which prohibits agreements to enhance unreasonably the price of a product, or otherwise to injure competition unduly.[57] While the actual application of the act to the fee schedules used by the OAA and the APEO is not yet clear, it seems likely that the associations will have to refrain from attempting to enforce adherence to the fee schedule, and might have to drop the fee schedule entirely.

We can now look in more detail at how fees are established in each of the professions. The OAA prepares and publishes a minimum fee schedule and explains how to calculate the fee. This schedule represents recommended minimum fees that according to the OAA are designed to ensure a competent level of architectural work. The fee schedule identifies 11 divisions for the total cost of the project from under $125,000 to over 25 million dollars. It identifies 6 building categories which represent differing degrees of complexity in the design process. Fees for projects in division 1 (under $125,000) are to be negotiated on a per diem basis. All other fees are specified as a dollar amount for the minimum project cost in the division plus a percentage of the remaining project cost. Generally the percentages decline with total project costs and increase with building complexity.

The fee schedule can only apply to private, commercial construction. Public bodies and governmental ministries generally negotiate with the OAA to establish an individual fee schedule applicable to the particular public body.[58] The

OAA states that the minimum standard fee schedule should be adhered to by members and it has two regulations prohibiting a member from undercutting fees where that would result in a deterioration of services. There seems to be a presumption that lower fees will reduce the quality of work.

In practice, the OAA fee schedule appears to be used as a guideline, but is not strictly adhered to. The fee schedule is frequently used as a starting point for negotiations, but is often modified because it does not seem to apply to particular situations.[59] The actual fee arrangements used by the profession include a specified discount from the schedule, per diem rates for design and feasibility studies, fixed fees for working drawings, per diem plus a percentage of the project cost, a fixed dollar amount per residential unit designed, an amount estimated on the basis of what the client can afford, and even equity participation in the project.

Interviews with architectural firms confirmed the variety of fee arrangements discussed above. Table III.C.3 shows the frequency with which interviewees reported the use of various methods of fee calculation. It appears that most jobs are done on the basis of a percentage of the cost of construction, but that many firms use some of the other methods some of the time. Time and expenses tended to be used for partial services such as feasibility studies, small jobs and work for developers. Fixed fees were used especially for developer but also for industrial work and some simple jobs.

Table III.C.3

Method of Fee Calculation - Architects

(as stated by architects)

Method	Number of times mentioned
Percentage of construction cost	21
Time and expenses	21
Fixed fee	18
Time and expenses up to a limit	5
Share of equity	1
Royalties	1

Source: Architecture Interviews, p.24.

Of 20 principals asked about the role of the OAA fee schedule, 9 reported that they followed the schedules with minor exceptions, 7 that they follow the schedules with some flexibility, while 4 reported that they use it as a guide but tend to charge less than that schedule.[60] Large firms tend to follow the schedule more closely than small firms, while the small firms that do more developer work and less purely design work tend to use the schedule less. One design-oriented architect stated that the fee schedule was sufficiently high to permit good design, but conceded that it also permitted some architects to make big profits by cutting the time spent on design.

The Survey of Firms asked firms to indicate the method of fee calculations used by them. The analysis of responses to questions V.2 are shown below in Table III.C.4. The responses of firms differ from those of the clients[61] primarily in emphasizing the percentage of construction cost method.

Like the OAA, the APEO publishes a scale of fees and a description of "performance standards" specifying the work that should be expected for those fees.[62] The performance standards list 8 types of services with a fee schedule for each. These service types range from consulting engineering services to the urban development industry, through advising on and reporting on oil, gas and mineral properties, to consulting services for building projects. Within each of the 8 performance standard areas, there is a breakdown of

TABLE III.C.4

Fee Calculation Method for Architectural Firms[a)]

Reported in Firm Survey

Fee Calculation Method	Per cent of all assignments where used
Time and expenses	29
Percentage of construction cost	44
Time plus percentage of construction cost	1.6
Fixed cost	20
Value of service to client	4
Other	0.1
	100%

[a)] Percentage of all assignments using each method, averaged over all firms. Weighted by firm SIZE.

Source: Firm Questionnaire V.2

categories of service such as: category 1 advisory services; category 2 pre-design and feasibility studies; category 3 preliminary plans and specifications; and so forth.

The fee scales are divided into Scale 1 which is time plus expenses and Scale 2 which includes a series of tables based on a percentage of cost of construction plus reimbursement for defined expenses.

Thus the fee schedule for engineering services is actually a complex booklet in which an attempt has been made to tailor the fee calculations to the work that is performed. In the past, the code of ethics explicitly prohibited competitive bidding and fee cutting and thereby required adherence to the minimum fee schedules. Currently, and in part in response to the extension of the Combines Investigation Act to cover services, the APEO says it is not involved in any way with the enforcement of the suggested scale of fees.[63] While the APEO receives complaints every year, both from engineers regarding fee cutting by other engineers and from clients regarding overcharging, it takes no action in such cases other than to recommend a voluntary adjudication service where the parties can submit their dispute to binding arbitration if they choose. The only action that the APEO might take with respect to alleged fee cutting could be enforcement of its performance standards if it could be shown that the low fees had led to substandard work. Obviously this is a far more difficult task than proving that low fees were charged.

In practice, it appears that engineering firms compute fees on several bases including per diem rates, payroll costs multiplied by a factor, a lump sum percentage of construction costs, expenses, and various combinations of these.[64] The fee for a project may not even be presented in an engineer's proposal to work on the project. Typically a client will select a consultant based upon several proposals from competing firms and after the leading proposal has been chosen the fee will be discussed. If the fee is too high, then the next leading consultant may be chosen.[65] Although the APEO strongly disapproves of competitive bidding, this is required on some types of jobs, particularly governmental work.

It appears that the fee schedule provides a useful guide and is adhered to in a wide number of cases. It should not be surprising to find it reasonably acceptable to large numbers of firms and clients in part because it is worked out in negotiations between the professional organizations and major client groups. It is clear, however, that some jobs are taken at fees less than the schedules would require. Large firms that may be reluctant visibly to cut fees may underestimate the number of hours, with the net effect of providing a lower total fee than the job would have required on the fee schedule. The desire of large firms to appear to stick to the fee schedule suggests an oligopolistic pricing structure in which firms are hesitant to seem to abandon the fee schedule for fear that all firms would do so leading to a general tumble in the rates.

Interviews with engineering firms showed that approximately one-fourth of all respondents classified their clients as price sensitive.[66] Developers and governments were listed as the most price sensitive clients. The client generally knows the price of the engineering services at least approximately before a contract is signed, either because he knows his budget or because of the APEO fee schedule or from experience. Approximately one-fourth of the firms indicated that the APEO fee schedule was useful in setting fees, half felt that it was a guide but not to be closely adhered to, and one-fourth felt that it was of no use. Table III.C.5 shows the number of firms using three different calculation methods for determining fees on different types of jobs. A majority of the firms interviewed indicated that competitive bidding or competitive proposals were common in the industry.

Interviews with engineering firms engaged in highway design yielded results similar to those for firms in building design except for less use of the fixed fee. Table III.C.5 shows different fee calculation methods used in different circumstances with respect to highway design. All the firms in highway design felt that the APEO fee schedule was useful as a guide both to the client and to the firm. All stated that competitive bidding does occur in highway design.[67]

The Survey of Firms asked engineering firms to describe the way in which their fees were calculated. The answers to this question are shown in Table III.C.6.

Table III.C.5

Method of Fee Calculation - Engineers

a) Building Design

Method	Number of times mentioned
Percentage of construction cost	21
Time and expenses	26
Fixed fee	16

b) Highway Design

Method	Number of times mentioned
Percentage of construction cost	6
Time and expenses	6
Lump sum	1
Combination	1

Source: Engineering Interviews, p.15 and Highway Interviews, p. 6.

TABLE III.C.6

Fee Calculation Method for Engineering Firms[1]

Fee Calculation Method	Per cent of all Assignments
Time and expenses	50
Percentage of construction cost	15
Time plus percentage of construction cost	3.1
Fixed fee	24
Value of service to client	4.3
Other	3
	100%

Source: Firm Questionnaire V.2

1 Percentage of all assignments using each method, averaged over all firms. Weighted by firm size.

Interestingly, time and expenses is the predominant method of payment. This is in contrast to the responses for architects, which emphasized the percentage of the construction cost method. Transportation clients reported no use of fixed fees.

The Client Survey asked clients of both architectural and engineering firms about the method of fee calculation and the importance attached to the fee. The responses to this question are shown in Table III.C.7. The fixed fee was the most common overall. The percentage of construction cost method was almost equally popular, although it was not used in private residential work. Fees based upon the professional time involved were used significantly in both aspects of the private sector, and for government transportation work. The private residential clients also used a method based upon the construction cost per residential unit designed. This seemed to be particularly popular for developers, but was not used by any other client group.

The clients were also asked what determined the type of fee used. Responses here were quite varied, including in some cases the type of building being constructed, and others the type of service provided by the consultant, and in still others the nature of the project or the preference of the client. Interestingly, the preference of the consultant was mentioned only once.

When asked at what point in the development of the project fees were first discussed with the consultant, about

Table III.C.7

Method of Fee Calculation Reported by Clients

Number of Clients Reporting

Method of Fee Calculation	Client Type: 1 Gov Res	2 Gov Non-Res	3 Private Res	4 Private Non-Res	5 Gov Trans	Total
1. Percentage of construction cost	1	5	0	5	2	13
2. Fixed fee	2	2	7	4	0	15
3. Time	0	1	2	5	1	9
4. % of construction cost per unit	0	0	3	0	0	3
5. (2) and (3)	0	0	3	0	0	3
6. (1), (2) and (3)	0	1	2	0	0	3
7. (1) and (3)	0	3	0	0	0	3

Source: Client Survey, Question 18.

half of the clients reported that fee discussions took place at the initial contact between the client and the consultant. In ten per cent of the cases, fees were first discussed before the actual design work commenced, while in fifteen per cent they were mentioned when the consultant was retained. This shows that in the majority of cases the discussion of fees took place at an early stage, before any final decision about retaining a particular consultant was made. It does not appear that a significant number of clients make an irrevocable decision to retain a consultant without knowing what fee will be charged. This suggests that there should not be a large number of surprises when the final bill for consultant services is presented.

As was mentioned earlier in this report, other questions attempted to determine how important clients felt the consultant's fees were. The responses to those questions indicated that many clients did not feel that the fees were a terribly important factor in choosing a firm, and only a small percentage of clients were particularly fee sensitive.

Finally, the clients were asked what method they used to determine whether the fee charged by the consultant was appropriate. A variety of answers were received, but the most common, representing about one-quarter of all clients interviewed, stated that they relied upon the OAA or the APEO fee schedule as a guide to judging the appropriateness of the fee charged. Thus for a substantial number of clients, the fee schedule is seen as a guide to ensure that the fee they

are charged is not out of line with a standard. This is consistent with the assertion by the firms that they frequently use the fee schedules as a guide if not as an absolute mandate when determining the fee to be charged.

We divided the responses on this question among informed and uninformed clients according to the self-rating described above. The results are shown in Table III.C.8. Twenty-five per cent of the uninformed clients did not attempt to determine whether the fee charged was appropriate, while nineteen per cent of the informed clients took no such steps. Once again, the uninformed clients appear slightly less diligent in investigating the details of the relationship with their consultants. The largest number of informed clients relied upon "shopping around" to determine the appropriateness of the fees, while a significant number relied on their own experience, the OAA or APEO fee schedule, or checked the fee calculations using their in-house staff. Among the uninformed clients the fee schedules were the most important means of verifying the appropriateness of fees, while comparing with other projects ranked second. Only four per cent of the uninformed clients reported that they shopped around.

The clients of both architectural and engineering firms were asked about the use of the fee schedules prepared by the OAA and the APEO. A significant number of clients of all types indicated that the schedule was used as a guide with the exception of private clients doing residential construction who used it very little as a guide. A number of clients

Table III.C.8

Procedures for Checking the Appropriateness of Fees

Procedure	Percentage of Clients Reporting: "Informed" Clients	Percentage of Clients Reporting: "Uninformed" Clients
None	19	25
Own experience	19	14
Compare with other projects	10	14
Check figures in-house	14	7
Rely on OAA or APEO schedules	14	36
Shopped around	24	4
Total	100	100

Source: Client Survey, Question 21.

indicated that the applicability of the schedule depended upon the nature of the project itself. The number of clients who said that the schedule was used not at all was very small except for the private residential sector where a substantial majority indicated that the fee schedules were not used at all. Apparently most large development companies used several other methods including a fee per unit designed, which is unrelated to any of the fee schedules.

The clients were also asked whether there was any relationship between the amount paid for design services and the quality of the design work done. A total of thirteen clients answered this question in the affirmative, while thirty-three answered in the negative. Some firms answering in the negative went on to say that one might pay the same fee to several different firms and receive a substantial variation in the quality of the work performed. A few said either that the quality of the work depended in part on input from the client or that most consultants do the best they can regardless of the fee. The conclusion one could draw from these responses is that about one-quarter of the clients believed that they can ensure high quality work by paying a high fee, or must accept low quality work simply because they have negotiated a low fee. Implicitly then, most firms would look to some factors other than the fee for an indication of the quality of professional services they received. A somewhat larger percentage of the uninformed clients believed that a relationship between fees and quality did exist,

but the difference was not large enough to be significant.

The importance of the fee as an indicator of quality was further diminished by another set of responses to a question whether the clients were aware of substantial quality differences among firms. Forty-one clients indicated that they were aware of significant quality differences among firms, while only eight said they were not. This belief in significant quality differences combined with the belief that the fee itself does not determine quality means that a firm would experience substantial variations in the quality of work performed for a given fee.

Several conclusions may be drawn from the above description of pricing and price setting by architectural and engineering firms. The publication of fee schedules by both the OAA and the APEO would appear to be price fixing if adherence to these minimum fee schedules were enforced. In fact, however, neither professional body currently purports to enforce its minimum fee schedule, and in practice there are many deviations from it. Thus the situation appears more like a case of oligopolistic price leadership, where the leadership is provided not by a dominant firm but by the professional body.

There are reasons, however, to believe that the effect of these price schedules may be even less than the effect of price leadership in an oligopoly. First, the industry structure described above suggests an oligopoly with a large number of members, in which policing of a set of prices would

be difficult in the best of circumstances. Second, the fee received by a firm is in many cases not a matter of public record, and deviations from the fee schedule are therefore not as obvious as in a case of a store selling a commodity with an advertised price. So long as firms are not required to register their actual contract rates with the professional organization, the incentive not to compete on price is relatively small. Third, there is compelling evidence of widespread deviations from the fee schedule in the case of architects and substantial deviations in the case of engineers. Fourth, the product being sold is a very heterogeneous one. The fee schedules are themselves quite complicated, and yet the practice is far more complex than the fee schedules. This suggests that it is very difficult to capture in any finite fee schedule an accurate estimate of the input or cost required to do an adequate job on the infinite variety of services that these firms perform. This weakens the argument in favour of a rigid fee schedule, and increases the pressure to deviate from it. Finally, the engineering fee schedule is arrived at by negotiation between the engineering organizations and several client groups. It thus falls somewhere between a price fixed by the seller and a price negotiated between the buyer and the seller of services. To the extent that it represents a negotiated bargain, it can hardly be regarded as a unilateral profit-maximizing price schedule.

It appears from interviews with both firms and clients that many of them find the fee schedule to be a useful

starting point for discussions and estimations of the appropriate fees. Because of the complexity of the services offered, it seems possible that the provision of a fee schedule may provide some types of clients with very useful information that they could not gather otherwise at a reasonable cost. Thus it is possible that the fee schedule improves the performance of the pricing system rather than harming it. While this conclusion could not come out of a model of perfect information, it is possible given the high cost of clients making independent assessments of all proposals and fee estimates.

On the other hand, there is little support for the proposition, often advanced by the professional bodies, that minimum fees are necessary to ensure a satisfactory quality of work. Most clients do not believe that there is a reliable relationship between fees and quality. Most clients believe that despite the current fee schedule, there are substantial variations in quality. And most clients list a host of factors, other than fees, that they use to select a firm and ensure that they have received adequate service.

3. Control of Product Quality

This section is concerned with the way in which the quality of professional services rendered by architects and engineers for building design is controlled. Both the APEO and the OAA have suggested that a primary reason for the self-regulatory powers of these associations is the need to protect the public; to protect uninformed clients and third parties from

firms that might charge excessive prices or render services that were of substandard quality, or both. Furthermore, the associations suggest that the minimum fee schedules are necessary to ensure a satisfactory level of quality on the grounds that if firms charge less than the recommended schedule they would be unable to apply sufficient effort to the work in order to provide satisfactory quality. This section will first consider the theoretical arguments for and against the proposition that professional regulations in general and minimum fees in specific are either sufficient or necessary to maintain satisfactory product quality. We will then look at the limited evidence available from the surveys on this issue. The theoretical analysis will be relatively brief, since another study is looking at this in substantially greater detail.[68]

If we consider the supply side of the professional services market, firms could reduce their fees yet maintain quality by reducing the wage per unit of work of their staff, particularly professionals. This would work for the entire industry if the supply of professionals was relatively inelastic. If the supply of professionals is elastic with respect to the wage then reducing these wages would reduce the quantity and/or quality of incoming professionals. Since substantial training is involved, adjustments to changes in relative wages would be slow, but long range effects would have to be considered.

Looking at the demand side of the market, if we assume that all clients are highly sophisticated, then we should assume that they will look for a combination of good

quality and reasonable fees, and demand reduced fees only to the extent that quality is not unduly sacrificed. In such a case, no minimum fee schedule is necessary because informed clients can protect themselves against substandard services. If we assume that clients are unsophisticated, then they will not be able to detect reductions in the quality of services, and may need some protection. However, there is no reason why a firm could not charge a fee specified in the fee schedule and still provide substandard services. If the client is unsophisticated, he is not protected from receiving poor quality services by paying a high price, since he cannot detect the quality of the services he receives.

There is one possible additional link between the minimum fee schedules and the enforcement of professional standards. While the payment of a minimum fee does not ensure that quality services will be received, it is possible that the minimum fees are designed to provide a comfortable income in times when professionals are fully employed. If the fee schedule raises incomes above what they would be in the absence of the schedule, or in other occupations which these professionals might have sought, then the threat of disciplinary action or being dismissed from the profession is far more serious than would otherwise be the case. It is more serious to be prohibited from practising in a high income profession than to be prohibited from practising in a low or medium income profession. Thus one might view the minimum fee schedule not as a means of ensuring high quality services,

but as a means of providing rents that can be taken away for unprofessional behaviour.

The above analysis suggests that if there are clients who need some form of protection against low quality services, that protection will not necessarily be afforded by minimum fee schedules. Minimum fees may allow a firm to provide high quality services, and may entitle a client to high quality services, but they do not ensure that this quality will be received.

The Survey of Clients included a question asking "are there any specific things upon which an organization such as yours can rely to ensure that it is getting what it pays for in building design services when an architect, engineer or other professional is retained?" Table III.C.9 shows the number of clients mentioning each of seven specific sources of quality assurance separately counted for architects, engineers and other professionals. The responses in that table show that the reputation of the professional firm is the most important factor that clients rely upon to ensure a satisfactory quality of services. This is consistent with the preceding sections on how clients choose professional firms, where both clients and firms emphasize that the reputation of the firm, in various forms, was the most important factor in selecting a firm.

Items 6 and 7 in the table, the terms of contract and the exercise of approval, both refer to the client's detecting the quality of services provided and insisting that he receives a quality that is satisfactory. While these rank

Table III.C.9

Sources of Assurance of Quality Control

	Assurance	Number of Client Mentionings Type of Professional: Architect	Engineer	Other
1.	Reputation of professional firm	35	23	10
2.	Regulatory agency (e.g. municipal building department)	8	7	1
3.	Professional bodies (APEO, OAA)	10	9	2
4.	Professional ethics	18	16	3
5.	Liability insurance	7	5	1
6.	Terms of contract	28	27	
7.	Exercise of approval a)	26	25	5
8.	Other ("checks by client himself", etc.)	18	20	5

a) A common contractual provision that the work shall be deemed completed when the client approves of it.

Source: Client Survey, Question 24.

somewhat behind the reputation of the firm, when taken together they are substantially more important. Both of these of course require some sophistication on the part of the client, or that he obtain an independent assessment of the work. Only 20 to 40 per cent as many clients mentioned the professional bodies as mentioned the reputation of the professional firm. Thus the professional bodies as well as other regulatory agencies such as municipal building inspectors, building codes and so forth, are low on the list of sources that clients turn to for assurance of the quality of design services. This would suggest that the regulatory role of the professional body is not particularly important, or is not important for most clients.

The mystery in this table is the intermediate number of replies mentioning professional ethics. If this is a disembodied morality thought to be possessed by professionals and professional firms, then it is presumably something upon which all clients, informed and uninformed, can rely independent of regulatory agencies or professional bodies. On the other hand, one might assume that the ethical standards held by the members of the profession are raised by the existence or operation of the professional association. It is even conceivable that professional ethics are raised by the receipt of large fees, although this is more difficult to accept. In any event, the professional ethics responses may be in some way related to the professional organization, which would substantially enlarge the role of these organizations as perceived by the client.

While the responses to this question are not unambiguous, the clients seem to rely primarily upon market forces of one form or another to ensure the satisfactory quality of the professional services that they receive. There is relatively little direct reliance upon regulatory agencies or the professional organizations.

If we separate the clients into informed and uninformed groups, a few interesting patterns emerge. As between these two groups, the uninformed clients rely somewhat more upon assurance number 1 - the reputation of the professional firm; number 4 - professional ethics; and number 5 - liability insurance. There is also greater reliance on the professional bodies. Thus the uninformed firms tend to rely less on their own ability to measure and demand service quality and more upon outside market forces and a disembodied morality. There is not, however, a dramatic reliance by the uninformed upon the regulation of the professional body.

The reliance upon the reputation of the firm depends upon a substantial proportion of all clients being reasonably well informed so that there is an active source of information about quality differences which will develop accurate reputations. Referring back to the discussion of clients above, it would seem that a substantial majority, perhaps three-quarters, regard themselves to be well informed with regard to both technical and economic aspects of building design, and to have substantial technical training or experience which would justify this level of confidence. Thus

the reliance on reputation seems to be founded upon a substantial body of clients who are in a position accurately to assess the performance of a firm.

This does not mean that the uninformed client is perfectly protected. It does mean that there are substantial information sources to draw upon if he wishes to select firms based on their reputation. The real problem, however, may well be confined to the client who is both uninformed, and either not sufficiently diligent or without the resources to inquire about the reputation and experience of the various firms he might select. From the information available to us it is not possible to resolve whether the existence of the professional association provides additional protection to such a client. It seems unlikely that minimum fees offer such protection.

The Client Survey asked "has your organization encountered major problems in its past involvement in building design such as quality of design work, negotiation of fees, co-ordination of design, etc. Table III.C.10 shows the response to this question. Of the 49 clients in this survey, 25 reported no major problems. A similar number reported some major problems including 10 with design errors and omissions, 3 with cost or time of the project exceeded, 6 with co-ordination problems, and 3 reporting fee-quality problems. The latter tended to be complaints that the fee was large in relation to the actual work that was performed. While these results are interesting, one cannot place too

Table III.C.10

Occurrence of Major Problems
(Number of Clients Mentioning Problems)

Problem Type / Client Type	1 Gov Res	2 Gov Non-res	3 Private Res	4 Private Non-res	5 Gov Trans	6 Total
None	0	3	13	7	2	25
Cost, time exceeded	0	1	0	2	0	3
Coordination	0	2	1	3	0	6
Design errors & omissions	1	5	1	2	1	10
Fee-quality	2	0	1	0	0	3

Source: Client Survey, Question 37.

much emphasis on them because it is possible that some problems occurred that were not detected by the client and therefore not reported. In other cases, a "problem" might arise primarily from unrealistically high expectations on the part of the client. Still, the survey does show what clients perceive to be their problems.

Table III.C.11 shows a distribution of these problems separately for informed and uninformed clients defined according to the clients own rating of his expertise in technical and economic aspects of building design. The proportion of clients reporting no problems is virtually the same for both classes of clients. The only substantial differences seems to be that informed clients are more bothered by co-ordination problems and by the relationship of fees to quality, while uninformed clients are more concerned about cost of time estimates for a project being exceeded. The latter might be attributed to the better capability of informed clients to estimate realistically the time and cost needed for a project.

When asked whether their problems occurred with architects or engineers, the clients indicated a slightly greater number of problems with architects than with engineers. This result, however, is difficult to interpret because while more clients mentioned hiring architects than engineers, it was difficult to assess the total number of projects in which each profession had been involved, and therefore the proportion of contacts that led to complaints is unknown.

Table III.C.11

Distribution of Problems Among Informed/Uninformed Clients

Problem Type	Client Sophistication: Informed (%)	Client Sophistication: Uninformed (%)
None	50	54
Cost, time exceeded	--	11
Coordination	15	11
Design errors and omissions	20	20
Fee-quality	17	10
Other	5	-
	100	100

Source: Client Survey, Question 37.

The clients were then asked an open-ended question about how they had resolved their problems. The results are shown in Table III.C.12. Eleven clients reported that their problems were in some way corrected by the client himself. Six reported negotiation with the consultant. Lesser numbers of clients reported that problems were solved by correction by the consultant, termination of the contract or relationship, or litigation. When these responses are analyzed separately for informed and uninformed clients, the only significant differences that emerge are that uninformed clients tend to use negotiation to resolve the conflict while the informed clients tend more to use litigation. When asked whether they were satisfied with the resolution of their problems, ten clients responsed yes, eight said they were partly satisfied, four said they were dissatisfied and one said the problem was not yet resolved.

Because of the non-statistical nature of the client survey, it would be a mistake to place too much importance on the specific numerical analysis of problems between clients and professionals. A few conclusions may, however, be drawn from this portion of the survey. First, a large number of clients do not feel that they have had major problems in their dealing with architects and engineers. Secondly, of those who have encountered problems, a substantial majority have been at least partly if not fully satisfied by the resolution of that problem. We do not have a good basis from this survey for distinguishing the problems encountered with architects and with engineers.

Table III.C.12

Resolution of Problems

Method of Resolution	Number of Clients Mentioning	Percent of Clients Informed (%)	Uninformed (%)
Negotiations	6	17	31
Corrected by client	11	42	46
Corrected by consultant	2	8	8
Termination of contract/relationship	3	8	15
Litigation	2	17	--
Other		8	--
		100	100

Source: Client Survey, Question 39.

Finally, some evidence appeared from the interviews that is not in the preceding tables. The clients who described problems frequently indicated that they regarded these problems, even errors and omissions in design, as the ordinary problems that inevitably occur with human error in complicated technical matters. We did not get a sense from the survey of high levels of dissatisfaction on the part of clients with the professional services they were receiving.

The usual caveat applied to the client survey must be emphasized here. We have not included a representative number of private individuals as clients in our survey. It is quite possible that these people, being the least informed clients, might have suffered the greatest problems. Unfortunately, we simply did not have sufficient information to comment on the problems encountered by private individuals and their dealings with architects and engineers.

It appears from the evidence in this and preceding sections that a few clients rely upon the payment of fees according to a schedule to ensure satisfactory performance of consulting services. Theory suggests that set fees are a poor guarantee of quality, and this is borne out by client opinions. Most clients instead rely upon the reputation of the professional firm that they hire and upon their own ability to observe service quality and demand their money's worth. While about half of all clients mentioned major problems with professional firms, most of these problems were ultimately resolved to the partial or full satisfaction of the client.

Clients do not appear to rely heavily on the professional bodies either to ensure good work or to resolve many problems that arise. Thus the major source of quality control seems to be direct market forces with the self-regulation of fees or performance by the professional bodies playing a minor role.

D. SUMMARY OF FINDINGS

It is difficult to summarize in any concise form the results of analyzing the very diverse practices of architecture and engineering in Ontario. What follows will be an attempt to summarize the main points that have been uncovered. The interested reader, however, is urged to return to the relevant section of this chapter for more details and qualifications regarding these conclusions. The conclusions will be listed under a number of sub-headings relating to the sections of this chapter.

1. Product Market

It appears that each of the fields of practice listed in Table III.B.1 is distinct from each other field. Most firms concentrate most of their practice in one of these fields, with limited activity in three or fewer other fields. There is no consistent relationship between practice in one of these fields and practice in any other.

Among firms engaged in building design, fifteen specialties were identified. It was found that in several

cases two or more of these specialties tended to be practised by the same firms. If the specialties that tend to be practised together are grouped, the result is a list of eleven independent specialties in the field of building design. (Table III.B.3) The average firm claims expertise in several of these specialties, with mixed firms claiming the broadest range of expertise and engineering firms claiming the narrowest. (Table III.B.4) Each of these specialties is a separate market, although most firms are active in several. Both firms and clients indicated that a firm's reputation for experience in a specialty was an important distinguishing characteristic of that firm.

It has been impossible to determine from the data collected by this study whether various building types constitute separate sub-markets within the field of building design. Some evidence suggests that firms tend to become known for a certain building type such as hospitals, schools or office designs, and then tend to receive subsequent commissions in that area. We are unable to ascertain, however, the extent to which a firm is restricted to the building type for which it has established an expertise.

2. Geographical Market

No simple definition seems to be entirely satisfactory for specifying the geographical market areas over which firms do business and compete. The city in which the firm is located appears too strict a definition, since only one-third of the clients of engineering and mixed firms are

said to be located in the same town as the firm itself, while two-thirds of architectural clients are located in the same town. (Table III.B.10) The entire Province may be an appropriate geographical market for engineering and mixed firms, since 75 and 70 per cent of their clients respectively are within the Province. Ninety per cent of architectural clients are in the Province, however, suggesting that a smaller unit might be more appropriate. Thus it would appear to make sense to analyze both the postal code letter, of which there are five in the Province and the entire Province as alternative definitions of the geographical market within which firms do the preponderance of their business. The data do indicate that architectural firms do a higher proportion of their business closer to their own home than do engineering and mixed firms.

3. Size Distribution of Firms

The firms practising architecture, engineering and in mixed practice represent an enormous range of sizes, from one man operations up to those employing over 100 persons. If we measure the size of a firm by an index based upon the number of professional and non-professional employees, the four largest architectural firms in the province represent 15 per cent of the total size of all architectural firms reporting while the four largest engineering firms represent 10 per cent of the total size of all engineering firms reporting. (Table III.B.16) The four largest mixed firms are over 40 per

cent of the total size of those firms.

If we treat each field of practice separately, the four-firm concentration ratio for engineering firms ranges from 15 to 58 per cent in these fields. (Table III.B.17) If we look separately at engineering and at architectural firms, and calculate four-firm concentration ratios for each postal code, these ratios are in the range of 23 to 91 per cent. (Table III.B.19) Building design is the least concentrated, while transportation design is above average. If the building design market is divided by specialty rather than postal code, the ratios are mostly in the 17 to 50 per cent range, with some higher. (Table III.B.20) Thus any division of practice into the sub-markets yields reasonably high concentration ratios when architectural, engineering and mixed firms are viewed separately.

If on the other hand, architectural and engineering firms are grouped together, which implies that they are regarded as competing in the same market, the same market subdivisions yield concentration ratios generally less than 50 per cent. (Tables III.B.23, 24) This suggests that if architectural and engineering firms do compete with each other at least for some types of work, the structure of the building design business is reasonably competitive with the exception of a few specialties and geographical areas. The concentration of engineering firms in fields outside of building design is variable, but yields at least a moderately competitive structure. If on the other hand, architectural and engineering firms are regarded as not

competing with each other even in specialties in which both claim expertise, then the structure of the building design business would be regarded as not very competitive: it would be a reasonably concentrated oligopoly in many cases.

4. Size Distribution of Jobs

The survey of firms showed a large number of small jobs, involving fees of less than $1,000. (Table III.B.30) Almost 30 per cent of all architectural jobs were in this size range, and almost 40 per cent of engineering jobs. If this heavy representation of small jobs is correct, it suggests a number of cases where the client cannot afford to expend much time and effort in finding a reliable firm or evaluating its work. It was not possible to determine what proportion of these jobs represented repeat business with the same client.

5. Characteristics of Clients in Building Design

The clients of architectural and engineering firms are at least as varied as the professional firms themselves. A substantial majority of those clients studied appeared to possess a high level of experience and expertise in selecting professional consultants and evaluating their work. A significant minority of clients, however, appear to be relatively uninformed about technical and economic aspects of the services that they purchase. Interestingly, these less informed clients do not appear to be more diligent in evaluating the work of the professionals they have hired to

compensate for the lack of experience and expertise.

6. Control of Quality in Building Design

It appears that most clients purchasing architectural and engineering professional services rely upon market-related mechanisms to ensure the quality of the services that are rendered. They tend to select firms on the basis of several aspects of the reputation of that firm, and on the basis of recommendations from others who are knowledgeable in the field. Many clients indicate that they examine the quality of the work performed for them, and are prepared to insist that an adequate standard of performance be met. The liability of a professional for inadequate work, and his insurance coverage seem to be of substantial importance. In comparison with the foregoing factors, there was substantially less reliance upon the professional organizations, government regulations, or other external bodies for ensurance of satisfactory service quality.

7. Barriers to Entry

The major barrier to the entry of new firms into professional practice appears to be the importance of an established reputation in securing business. Consulting services are inherently a non-standard product, and many aspects of the reputation of a firm and its principals are important in the selection of a professional firm. Thus it is difficult to start a new firm unless the principals of

that firm have already established a reputation. This would appear to be more true for engineers than for architects.

Aside from the needs for an experienced professional with an established reputation, the barriers to the entry of new firms appear to be quite small. We do not find economies of scale or the need for a large capital investment to be significant barriers as they are in some manufacturing industries.

While there are moderate barriers to the entry of new firms into the business, there are also barriers to the entry of new professionals into the business. Would-be architects or engineers must meet a carefully formulated set of educational and experience requirements and in some cases pass special examinations. There do not appear to be other important barriers to the entry of individuals into practice besides the registration requirements. It is impossible to say from the evidence in this study whether the current entry requirements for individuals are correct, too high, or too low.

8. Price Formation

The price or professional fee to be charged is usually, but not always, discussed early in the negotiations between a client and professional firm. The fee schedule prepared by both the engineering and architectural associations are often used as a guide by both the client and the professional firm. It appears, however, that the schedules are not always adhered to. In some cases, government agencies may insist

upon competitive bidding for projects. In other cases, a firm may offer or be requested to charge less than the established fee.

The clients of professional firms indicated that they believed there was generally a wide range in the quality of professional services offered. A majority of clients further indicated that they did not believe that there was a reliable relationship between the fee level and the quality of the services. In short, a majority do not believe that charging a high fee insures high quality work.

9. The Production Function

The data on firm manpower showed that within architectural, engineering and mixed firms there were substantial variations in the proportion of professional and non-professional employees. Discussions with both professional and paraprofessional staff indicated that the current range of personnel undertake a wide variety of duties, depending upon the skills and the needs of the firm. Thus some professional staff enjoy great responsibilities and do work of a high level of technical difficulty, while others are employed in positions of low responsibility and limited technical complexity. Paraprofessionals similarly enjoy high levels of responsibility and do technically difficult work in some cases, while in other cases they are in positions of limited responsibility and difficulty. It appears that under the existing situation, firms have attempted to use

their employees in the most productive way given their inherent skills. There is no indication that benefits would arise from restricting the freedom of firms to assign persons to tasks suited to their abilities as perceived by the firm. One can speculate that substantial costs might be imposed if attempts were made to restrict employees more than is currently the case in the scope of the work they may be requested to perform.

FOOTNOTES TO CHAPTER III

1. F.M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally, 1970) Ch. 1.

2. Ibid.

3. Richard Caves, American Industry: Structure, Conduct, Performance, 2nd ed. (Englewood Cliffs: Prentice-Hall, 1967).

4. Joe S. Bain, Industrial Organization, 2nd ed. (New York: Wiley, 1968).

5. Caves, op. cit., p. 16.

6. Ibid.

7. Ibid., p. 38.

8. Idem.

9. Ibid., p. 37.

10. Ibid., p. 17.

11. This is analogous to the definition of product markets based upon the cross-elasticity of demand for various goods, or their degree of interchangeability by consumers. U.S. v. E.I. DuPont de Nemours & Co. (1956) 351 U.S. 377 held that the proper market was not cellophane, but flexible packaging materials, because of their interchangeability. If wrappings are interchangeable, it is because they offer similar services to the customer; so firms are interchangeable if they offer similar services to the client.

12. See Tables IIC 10, 11, and 12 in Chapter II.

13. Scherer, op. cit., p. 10.

14. Ibid., p. 61.

15. Ibid., p. 51.

16. This percentage is from direct responses to Question III.3, and not from the fees data discussed above.

17. Client Survey, Question 5.

18. Ibid., Question 6.

19. Ibid., Question 13.

20. Ibid., Question 25.

21. Ibid., Questions 22 and 23.

22. Ibid., Question 15.

23. Ibid., Question 25.

24. Caves, _op. cit._, p. 41.

25. An example would be coal which comes in a variety of different grades. Each grade, however, can be described precisely, and most coal users would place the same relative evaluation on different grades of coal.

26. See, e.g., Scherer, _op. cit._, p. 129.

27. _Ibid._, p. 187.

28. Client Survey, Question 27.

29. Ibid., Question 30.

30. Caves , _op. cit._, p. 23.

31. Caves, _op. cit._, pp. 24-28.

32. _The Architects Act_, R.S.O. 1970, c. 27.

33. Appendix C of Research Directorate's Staff Study "History and Organization of the Architectural Profession in Ontario," 1978, p. 78ff.

34. _Idem._

35. _Ibid._, p. 111.

36. Appendix D of Research Directorate's Staff Study "History and Organization of the Engineering Profession", 1978, p. 123.

37. _Ibid._, p. 139.

38. Malcolm Reed, "Summary of Interviews with Architects", internal document, p. 30. Hereafter referred to as Architecture Interviews.

39. _Ibid._, p. 49.

40. _Ibid._, p. 32.

41. _Ibid._, p. 50.

42. Client Survey, Question 37.

43. Caves, _op. cit._, p. 28.

44. "History and Organization of the Architectural Profession in Ontario," _op. cit._ pp. 163-164; "History and Organization of the Engineering Profession in Ontario," p. 214.

45. Architecture Interviews, p. 8.

46. Architecture Interviews, p. 15.

47. Caves, op. cit., pp. 48, 49.

48. "History and Organization of the Architectural Profession in Ontario," op. cit. pp. 163-164.

49. Ibid., pp. 163-164.

50. "History and Organization of the Engineering Profession in Ontario," op. cit. p. 217.

51. Architecture Interviews, p. 22.

52. Ibid., p. 17.

53. See "History and Organization of the Architectural Profession in Ontario," op.cit.

54. F. Schliewinsky, "Summary Report - Engineering Firm Interviews", 1977, internal document, hereafter referred to as Highway Interviews, Part 2, Highway Design, p. 4.

55. Caves, op. cit., p. 42.

56. R v. Howard Smith Paper Mills, Ltd. et al (1954) O.R. 543.

57. Combines Investigation Act, R.S.C. 1970, c. C-23 as amended by S.C., 1974-75-76, C.76.

58. See "History and Organization of the Architectural Profession in Ontario," op. cit., section IV.2.2.

59. R. Kuris, T. Martin, Study of the Organization and Practices of the Architectural Profession in Ontario (Toronto: mimeo, 1974), p. 9.

60. Architecture Interviews, p. 26.

61. See Table III.C.7.

62. "History and Organization of the Engineering Profession in Ontario," op. cit. p. 220.

63. Ibid., p. 234.

64. Ibid., p. 240.

65. Ibid., p. 241.

66. Engineering Interviews, Part 1, p. 13.

67. Ibid., Part 2, p. 7.

68. M. Spence, "Entry, Conduct and Regulation of Professional Markets", Working Paper #2, prepared for the Professional Organizations Committee (1978).

CHAPTER IV

LEGAL ISSUES IN PROFESSIONAL JURISDICTION

S. Makuch

A. INTRODUCTION

> Before I'd build a wall I'd like to know what I was walling in or walling out.
>
> Robert Frost
> "Mending Wall" 1918

The purpose of this chapter is to deal with the legal problems of restricting the role of engineers vis-ã-vis that of architects in Ontario. The real issue is, therefore, whether there are considerations from a legal point of view to legislatively providing exclusive jurisdiction for architects in the design of buildings. In addition attention must be given to possible alternatives to such exclusive jurisdiction if it is found inappropriate. This chapter is therefore concerned not only with the economic analysis of chapter III and the description of building design in the chapter II but more importantly with the legal difficulties in establishing discreet areas of jurisdiction for the two professions. To some extent this must be related to public policy needs derived from the aforementioned chapters, but there is nevertheless certain information to be gained from examining the existing legal situation in Ontario, and its origins; from examining legislative attempts to deal with this problem in other jurisdictions in Canada and the United States; from examining other legislative techniques that might be available to solve the problem rather than providing exclusive jurisdiction for the two professions; and finally from considering the legal difficulties in trying to formulate exact and useful delineations between architects and engineers.

This chapter will examine these difficult legal considerations and suggest that as a result it is not advisable to attempt in the professional acts governing these two professions to provide separate jurisdiction for each group with respect to the designing of buildings.

The present legislation in Ontario does not clearly suggest such a separation of jurisdiction; nor does the trend in the cases decided under it. Moreover, the view that can be discerned in all jurisdictions in Canada and the United States from an examination of legislation respecting these professions is that there is a great deal of overlap between the functions of the two professions which cannot satisfactorily be legislatively divided. Indeed the trend in some jurisdictions appears to be to deal with many design professions - architects, engineers, landscape architects and technologists-in one legislative enactment.[1]

In addition the existence in Ontario of both building code regulations[2] and planning controls[3], which enable a public examination of a large part of the design process, would suggest little need for separate jurisdiction as those two pieces of legislation provide some assurance that human health and safety and aesthetics and desirable sensory responses from the public's perspective are addressed. Finally because of the interrelations of health and safety, aesthetics, and human activity discussed in chapter II and because of the close inter-relationship in practice of architects and engineers there is much difficulty in drafting or establishing legislation which can meaningfully segregate the two professions. It should be noted moreover that such conclusions are not inconsistent with the economic analysis found in

chapters II and III in that those chapters see an overlap between the two professions as well.

B. THE PRESENT ONTARIO SITUATION

The early years of legislation respecting architects in Ontario was one of gradual evolvement towards a prohibition against the actual practising of architecture by those who were not architects. Although the first Act regulating the profession was passed in 1890,[4] that Act was amended in 1925, 1931 and 1935. Throughout this period there was no attempt in the legislature to deal with the problem of engineers or indeed others who might be practising architecture by prohibiting such practice. Rather the legislation as first enacted in 1890 and as continued until 1937 was merely what might be described as a "holding out" statute in that it provided that no one could hold oneself out as a registered architect unless he was indeed registered under the Act.[5]

The initial impetus for legislative control over the practising of architecture appears to have come from Great Britain and been taken up by architects arriving from that country as an appropriate measure to ensure quality architecture for the public.[6] The origins of granting exclusive jurisdiction in this field were not therefore based on an assumption that all others must be restricted from the practice of architecture but merely on the assumption that the public had a right to know of the quality of service provided.

As noted this situation was changed in 1938 with the addition of a prohibition from practice section to the statute's holding out provisions. Section 18 of that Statute provided:

> Without restricting the generality of the foregoing, any person who prepares or offers to prepare for a fee or commission or other remuneration any sketch, drawing or specification for any proposed building structure, or for any structural alteration of or addition to an existing building structure ... shall be deemed to hold himself out as an architect.[7]

The absence of recorded debates in the Ontario Legislative Assembly makes the reason for the addition of this section difficult to ascertain although part of the concern appears to have been the increased competition from American architects.[8] It should be noted moreover that the 1935 Architects Act had attempted to deal with this problem by a provision to exclude American architects.[9] The movement in legislative policy from a mere holding out provision to a prohibition on practice appears to have resulted in part from competition from American architects but newspaper reports on the legislative debates indicate no clear definition of a public policy which assumed a need to ensure that architects and architects alone would provide design skills for certain buildings. Indeed, the 1931 legislation which merely prohibited the holding out of oneself as an architect provided for exemptions for landscape architecture while the 1938 Act provided with the general prohibition a number of exemptions including an exemption for engineers.

In summary then the legislative history of the establishing of exclusive jurisdiction for the role of architects, although sparse, does not indicate a strong concern with respect to the need to provide exclusive jurisdiction for architects in the design of buildings. The provision against practising as an architect took forty years to manifest itself. Moreover the legislation provided for exemptions to

both holding out and practising provisions while the impetus for the legislation that can be found appears to come from influences outside the province notably from Great Britain and the United States.

It is interesting to note that the authority to control the practice of engineering in the province moved in a similar way in that it commenced as a "holding out" restriction to one of prohibition of practice although over a shorter period of time.[10] Similarly the movement to prohibition in practice came in the late 1930s, in part, it would appear, as a result of the activity of the architects[11] but also because of American competition at a time of economic depression.[12] In addition the legislation affecting engineers displayed an initial concern regarding the opportunity of other groups to practise their occupations.[13]

It is clear that the early history of these two pieces of legislation means little in terms of what public policy should be today respecting the establishment of exclusive jurisdiction for either of these two groups. It does, however, indicate that there appeared to be no coherent or rational policy for the establishment of prohibitions against practice in these fields. Any desire to provide or require such a prohibition cannot be based on such legislative history.

C. JUDICIAL ANALYSIS OF PRESENT LEGISLATION

Even though the historical development in the legislation establishing the jurisdiction for these two professions does not indicate any clear public policy respecting exclusive jurisdiction it might be possible to discern such a jurisdiction through an analysis of the legislation as it exists today and its judicial interpretation.

The Architects Act[14] provides in s. 16:

> (1) Every person who, not being a member of the Association, or who, having been a member, has had his membership cancelled or is under suspension, or who, not being licensed under section 6, applies to himself the term "architect" alone or in combination with any other term, or who holds himself out as an architect, is guilty of an offence and on summary conviction is liable to a fine of not more than $100 for a first offence and to a fine of not less than $300 and not more than $500 or to imprisonment for a term of not more than three months, or to both, for any subsequent offence.
>
> (2) Every corporation that applies to itself the term "architect" or "architects" alone or in combination with any other term or that holds itself out as an architect or as architects is guilty of an offence and the corporation or any director thereof, on summary conviction, is liable to a fine of not less than $100 and not more than $500 for a first offence and to a fine of not less than $200 and not more than $1,000, or to imprisonment for a term of not more than three months, or to both, for any subsequent offence.
>
> (3) Without restricting the generality of subsections 1 and 2, any person or corporation who prepares or offers to prepare for a fee, commission or other remuneration any sketch, drawing or specification for a proposed building structure or for a structural alteration of or addition to an existing building structure, when such proposed work is to cost more than $10,000, shall be deemed to hold himself or itself out as an architect.[15]

The Act can be seen to reflect its origins with its "holding out" provision in subsection (1) which has been expanded by the definition of "holding out" to include the preparation or offering to prepare for remuneration any sketch, drawing, or specification for a proposed building structure or for a structural alteration of, or addition to an existing building structure. This subsection amounts to a definition of the practice of architecture.

The Professional Engineers Act[16] has a similar prohibition:

27. (1) Every person, other than a member or a licensee, who,

(a) takes and uses orally or otherwise the title "Professional Engineer" or "Registered Professional Engineer" or uses any addition to or abbreviation of either such titles, or any word, name or designation that will lead to the belief that he is a professional engineer, a member or a licensee or, except as permitted by section 2, uses the title or designation "engineer" in such a manner as will lead to the belief that he is a professional engineer, a member or a licensee;

(b) advertises, holds himself out, or conducts himself in any way or by any means as a member or a licensee; or

(c) engages in the practice of professional engineering,

is guilty of an offence.

This section, like s. 16 of The Architects Act, prohibits the holding of oneself out as an engineer unless one is registered and further prohibits the practice of engineering. That practice is defined in s. 1(i) of The Professional Engineers Act:

"practice of professional engineering" means the doing of one or more acts of advising on, reporting on, designing of or supervising of the construction of, all public utilities, industrial works, railways, tramways, bridges, tunnels, highways, roads, canals, harbour works, lighthouses, river improvements, wet docks, dry docks, floating docks, dredges, cranes, drainage works, irrigation works, waterworks, water purification plants, sewerage works, sewage disposal works, incinerators, hydraulic works, power transmission systems, steel, concrete or reinforced concrete structures, electric lighting systems, electric power plants, electric machinery, electric or electronic apparatus, electrical or electronic communication systems or equipment, mineral property, mining machinery, mining development, mining operations, gas or oil developments, smelters, refineries, metallurgical machinery, or equipment or apparatus for carrying out such operations, machinery, boilers or their auxiliaries, steam engines, hydraulic turbines, pumps internal combustion engines or other mechanical

> structures, chemical or metallurgical machinery, apparatus or processes, or aircraft, and generally all other engineering works including the engineering works and installations relating to airports, airfields or landing strips or relating to town and community planning.

It can be seen that there is indeed an overlap between the definition of practice in The Professional Engineers Act and the de facto definition of practice in The Architects Act. The latter Act refers to "sketches" "drawings" or "specifications" which can clearly be covered in acts of "advising on", "reporting on" and "designing of". Moreover "building structures" can be seen to overlap with steel, concrete or reinforced concrete structures and "generally all other engineering works". The Acts can be seen to cover to some extent at least the same areas that make up the practice of both architects and engineers.

The exemption provision in each of the Acts would seem to support such a view. The Architects Act provides that prohibition shall not be construed to prevent:

> (a) any person from performing his duties in the Canadian Armed Forces;
>
> (b) any member or licensee of the Association of Professional Engineers of the Province of Ontario under The Professional Engineers Act or any employee or person working under the responsibility of such member or licensee from performing architectural services in the course of any work undertaken or proposed to be undertaken by such member or licensee as an engineer;
>
> (c) any partnership, association of persons or corporation that is entitled to practise in its own name under The Professional Engineers Act in accordance with the conditions therein prescribed from performing architectural services in the course of any work undertaken or proposed to be undertaken by such partnership, association or corporation pursuant to such entitlement;

(d) any person or corporation from preparing a sketch, drawing or specification for a structure in, upon or pertaining to a mining property, or an alteration of or addition to an existing structure in, upon or pertaining to a mining property;

(e) a bona fide member of an architect's staff from preparing a sketch, drawing or specification in the course of his employment under the supervision of the architect;

(f) a bona fide building contractor, whether a person or a corporation, or a bona fide member of such contractor's staff domiciled in Ontario from preparing a sketch, drawing or specification for such contractor's own use as a building contractor in the construction or alteration by such contractor, or by tradesmen employed by such contractor, of a building structure, whether it be proceeded with or not, and obtaining remuneration therefor;

(g) any person or corporation from preparing a sketch, drawing or specification for interior decorations or the installation in the interior of a structure of fixtures, non-bearing partitions or equipment where the structural alterations involved do not raise considerations of strength or safety;

(h) any person or corporation from using the term "Landscape Architect";

(i) any person in the course of his employment under the supervision of or in conjunction with an architect from preparing a sketch, drawing or specification for work to be undertaken by his employer; or

(j) any person, firm or corporation engaged in the business of selling prefabricated building structures from furnishing such drawings, diagrams and directions as are required for the assembling and erection of such structures.[17]

The provisions for such exemptions, it seems appropriate to suggest, recognize that there may well be many members of society including engineers, contractors, mining surveyors, interior decorators and landscape architects who perform tasks that might well fall under the definition of making drawings for building structure.

In The Professional Engineers Act a similar recognition is found as the Act does not prevent:

> (a) any person from performing his duties in the Canadian Armed Forces;
>
> (b) any member or licensee of the Ontario Association of Architects under The Architects Act or any employee of such member or licensee acting under the direction and responsibility of such member or licensee from performing professional engineering services in the course of any work undertaken or proposed to be undertaken by such member or licensee as an architect;
>
> (c) any person who holds a certificate of qualification under The Operating Engineers Act from practising or designating himself as an operating engineer;
>
> (d) any person from practising as a bacteriologist, chemist, geologist, mineralogist or physicist;
>
> (e) any person from advising on or reporting on any mineral property or prospect;
>
> (f) any person from operating, executing or supervising any works as owner, contractor, superintendent, foreman, inspector or master,[18]

The scheme of both Acts appears to be a recognition that there are other occupations and professions which should be allowed to perform functions which fall under the definition of each profession.

The trend in the case law respecting these two Acts has supported such a view. The earlier case of Regina Ex Rel. Miller v. A.D. Margison and Associates Ltd.[19] supported the view that reciprocity or an exemption was provided in order to solve the problem that indeed there was a degree of similarity between the two professions:

> I cannot but think that it was the intention of the legislature to give reciprocal privileges, at least to the extent necessary to cover the facts disclosed, and that it is up to the client to weigh the qualifications of firms and engineers and decide which he wishes to employ, or indeed if he wishes to employ both ... Mr.

> Fleming contends that it is possible to decide whether a job is essentially one for an architect or one for an engineer. I can find nothing in the words of the legislation which enables the Court to draw such a line between the two professions.[20]

Similarly the case of Regina v. Greer Galloway and Associates Ltd.[21] in dealing with an attempt to divide the work of architects and engineers was unable to do so. It rejected arguments that architecture could be defined on the basis that it related to space for human use and posed the questions of designing factories that housed both machines and people, and the question of designing zoos which house animals. It was the court's view that the designing of such structures could be architecture. In addition it rejected an attempt to divide architecture and engineering in accordance with the amounts of time and money spent on the undertaking or work.[22] The court concluded that like the definitional approach this approach would not produce a meaningful division as it would be impossible to ascertain how much of time design was architecture and how much engineering.[23] The court in this case also concluded that any attempt at definition was meaningless because the designing of the school fell under both Acts and the engineer was in fact protected by the exclusion of s. 16 4(c) of The Architects Act and he was thus protected from prosecution.[24]

The most recent case regarding the jurisdictional dispute between architecture and engineering is that of Regina Ex Rel Parks v. B. H. Martin Consultants Ltd.[25] This is perhaps the most legally significant of the cases in that it was made by the Divisional Court of Ontario, the highest court to deal with the issue, and is the most recent case on the matter.

It is interesting to note as well that permission for leave to appeal this decision was denied by the Court of Appeal.[26] The Court in concluding its decision stated that "it can be readily discerned that there is an overlapping in the functions of the professional engineer and the architect".[27] Mr. Justice Cary in this case does not specifically deal with the reciprocal provisions but it appears that in dismissing the appeal he clearly implies that it applies and that the engineering firm in the case was therefore not guilty of breaching The Architects Act and could therefore design an apartment building.

The only case to result in the conviction of an engineer under The Architects Act was that of Regina v. Moll.[28] In that case unlike the three previous cases the engineer who was accused of breaching the Act actually held himself out as an architect and signed drawings as such. The Court, however, did perceive a distinction between architecture and engineering. After referring to the broad words describing engineering practice in The Professional Engineers Act, the Court concluded:

> Even placing an extended interpretation on these expressions I think it possible to distinguish an "engineering work" and an "architectural work", within I concede a rather narrow ambit. This approach recognizes that there may well be many works which fall in either category. However, I have concluded on the factual situation in this case a distinction can and must be drawn.[29]

Unfortunately the court does not proceed to draw the distinction but rather suggests that what the clients had sought was an architect and what the engineer had done was in essence pass himself off as an architect. The Court concluded that he could not avail himself of the protection of the Act as he was not acting in his capacity as engineer.

The case is not a particularly useful one in suggesting an alternative to the view that the legislation and judicial decisions are found in a scheme which recognizes considerable overlap between the two professions and provides reciprocity to ensure that each may practise his profession without the necessity of further registration as long as he does not hold himself out to be what he is not. The Court in the Moll case suggests that if there can be no distinction drawn between the two professions and the two Acts mean the same thing, then there is no necessity for the two Acts; one would suffice for both professions. Such a view ignores the problem of overlap and that although training, perceptions, and abilities may differ between the professions there may be much which is in fact similar or impossible to distinguish in the practice of design by the two professions.

The approach of the Moll case and the view that the two Acts must contemplate that architecture and engineering can be defined to be two separate distinct activities does not appear to fit with the general scheme of the legislation as mentioned earlier, but it also appears to fly in the face of a more detailed consideration of the Acts.

It has been argued that designing "steel, concrete or reinforced concrete structures" relates only to the "structure of a building", in other words to its skeletal framework.[30] It is further argued that the word building is conspicuously absent from the definition of the practice of engineering and that if The Architects Act intended that it should permit engineers to provide all the required design services for a "building" it would have so stated explicitly in the definition.[31]

Once again such an argument does not look at the Act as a legislative scheme designed to resolve the problem of overlap. Indeed, it could be argued that if such a view were taken of a structure then there would be no need for reciprocal arrangements as the restriction on engineering practice would mean that architectural activities could not be undertaken at all by engineers even as engineers. Moreover such a narrow view of engineering can be seen to cause difficulties in The Architects Act. If the structure is to be narrowed to mean "building structure" under the present The Professional Engineers Act then it can be argued that the words in The Architects Act referring to a proposed building structure or structural alteration have an identical meaning.

In short, it would appear that the general legislative scheme in Ontario is one which recognizes an overlap between the two professions - an overlap which even the Moll case recognizes[32] - and attempts to provide for it by reciprocating between the two professions by providing that each may practise the other's profession although they may not use the title of the other profession. Such an approach has been upheld on the whole by the Courts and appears from this initial analysis to be an appropriate interpretation from the Court's point of view as the cases all suggest a reluctance to attempt to define in detail the difference between architecture and engineering in the design of buildings and make practical application of that definition.[33]

D. LEGISLATION IN OTHER CANADIAN PROVINCES

It would appear from Table I that the general scheme of the Ontario Act of providing overlapping areas of jurisdiction can be found in at least four, possibly five, other provincial acts. The Acts of British Columbia, Alberta, Newfoundland and New Brunswick

indicate no attempt to specify in detail areas of exclusive jurisdiction, or field of practice in detail that are different between the two professions. The New Brunswick Engineering Professions Act[34] for example provides that "Engineering is the application of scientific principles and knowledge to practical ends as the investigation, design, construction or operation of works and systems for the benefit of man",[35] while the New Brunswick Architects Act[36] states that the practice of architecture means and includes "the planning, designing or supervision of the erection, construction, enlargement or alteration of buildings of any kind or nature".[37] The Newfoundland Engineering Profession Act[38] has a similarly wide definition of professional engineer. That definition refers to a person who by reason of his knowledge of mathematics, the physical and social sciences and the principles of engineering, is qualified to engage in the practice of professional engineering. Professional engineer means, under that Act,"such professional services as consultation, investigation, evaluation, planning, research design, and responsible supervision or any of them of construction or operation in connection with all ... structures..."[39] [sic] The Newfoundland statutes, moreover, contain no actual or implied definition of architecture or its practice.

All of the acts in this category contain reciprocal arrangements for both architects and engineers which further suggest a scheme of recognizing the difficulty of establishing separate distinct areas of jurisdiction. The reciprocating provisions can be seen as providing an area in which both professions may practise.

It should be noted that this view of the legislative scheme is not one based on judicial interpretation; but rather an examination of the various definitions. Indeed, for example, an early British Columbia case, found that in spite of the broad definition of engineering in the British Columbia Engineering Profession Act[40] which defines engineering in terms of the designing of any works which require the experience or technical knowhow suggested by the Act, and in spite of reciprocating under the Architectural Profession Act[41] which provided an exemption for engineers designing structures usually designed by an engineer, an engineer could not design a public theatre.[42]

The statutes of other provinces such as Prince Edward Island, and Nova Scotia may be viewed as not providing exclusive jurisdiction for either profession since the definitions included buildings for both architects and engineers. But in addition they can be viewed as favouring the engineering profession by not stipulating any reciprocal exemption for architects under their respective engineering acts.[43] This is perhaps because in the legislation thus far referred to the practice of engineering was more widely described than that of architecture. In every statute thus far dealt with indeed the issue appears to be whether the narrow part of building design ascribed to architects is included within the broader definition of engineering.

This view of the legislation can be supported by referring to the contrasting scheme found in Saskatchewan and Manitoba,[44] where definitions of architecture refer in both acts to the erection, enlargement or alteration of buildings and engineering practice is limited by reference to specific works in a schedule attached to the Act. The use of detailed references to specific works such as electrical machinery and apparatus and structures for housing them, and to such works as factories, warehouses, swimming pools, rinks, garages, cold storage plants, grain elevators, flour mills, hospitals, schools and public buildings can be seen to be an attempt to narrow the role of the engineer by precisely limiting the kinds of buildings he may work on. In doing so a specific area of jurisdiction is carved out for the architect and the engineer. Reciprocity is therefore perhaps not as necessary and indeed the Manitoba Act does not provide for engineers in that province to practise architecture. It, of all the provinces, has the narrowest definition of engineering with respect to building design.

It can be seen nevertheless that the provinces of Manitoba and Saskatchewan are the only provinces which clearly carve out exclusive areas of jurisdiction for the two professions. It also is clear that those areas are not the same, as the detailed schedule of the two acts is different, with Saskatchewan which allows reciprocity for engineers, having a much broader range of engineering activity (which includes as mentioned above, schools and public places), than Manitoba.

It may be argued that the Quebec statutes carve out areas of exclusive jurisdiction.[45] As well, the early decision of <u>The Province of Quebec Ass. of Architects v. Pery</u>[46] supports such a view for in it

the court adopted the reasoning of an earlier judgment which read in part:

> De tout çela, je croirais devoir comprendre, que l'architects est bien le maître en fair d'édifices, c'est-à-dire de bâtiments plus on moins considérables à l'exception seulement de ceux dont la loi attribué la construction à l'ingénieur civil ...[47]

This quote summarizes the approach of narrowing the area of jurisdiction for engineers vis-à-vis architects which is found in Saskatchewan and Manitoba. It suggests that within building design the architect is supreme and that a certain restricted area may be delineated for the engineer. The language of the Quebec Engineers Act could however be open to broader interpretation because although it refers to specific structures such as dams, sewer works and bridges it also refers to the foundations, framework, and electrical and mechanical systems of buildings and the structures accessory to such engineering works and intended to house them.[48] The Act continues that such work cannot be done by an engineer without an architect if it involves design, unless it relates to an existing building and does not alter the building's form. Section 5 of the Act then goes on to provide for the participation of architects with engineers with respect to such engineering works and thus the legislation really appears to be suggesting that this is an area of overlap where both architects and engineers should be involved. The Quebec legislation therefore stands somewhat alone in actively encouraging the activity of both professional groups in certain building design but it does nevertheless recognize the overlap between the two professions.

The general approach seen in legislation in Canada, however, appears to be one of viewing architecture as a special aspect of engineering with the latter being more widely defined. It is clear that on the basis of legislation found in Ontario, British Columbia, Alberta, Prince Edward Island, Nova Scotia and New Brunswick it is difficult to discern a clear distinction between the two professions. The exception to this approach seems to be Manitoba, Saskatchewan and Quebec where building design for engineers is narrowly construed - with the latter province attempting to provide an area of jurisdiction where both architects and engineers will be required. It should be noted, however, that the use of schedules in the Acts of Manitoba and Saskatchewan does not solve all difficulties. The term "public building" in the Saskatchewan legislation could be broadly interpreted while the reasons for having certain buildings in one schedule but not another are certainly unclear on the face of the schedule. The lack of consensus on buildings in the two schedules can further suggest that there is overlapping between the two professions and that it is difficult to sort out any clear and legally defensible distinction.

E. TRENDS IN THE UNITED STATES

A Survey of Laws Governing Registration of Design Professions,[49] indicates a similar trend in design legislation in the United States. That study reviews legislation governing architects and engineers in all of the American states and concludes:

> The astonishing fact revealed by the tabulation is that excepting those jurisdictions without a definition (of architecture and engineering) and Texas and Missouri for reasons noted, every statute defines the practice in terms of doing certain things in connection with certain objects. With very few exceptions, the architectural

> statutes see those objects as building structures, or appurtenances thereto. With very few exceptions, the engineering statutes see those objects as buildings, structures, utilities, machinery equipment, processes, and works generally. It is a fair conclusion that in a preponderance of jurisdictions the engineers are entitled under the definition of their practice, to do what the architects can do and a great deal more.[50]

Indeed a number of American states have chosen parallel registration procedures. For example, Alaska sees both the architect and the engineer engaged in "consultation, investigation, evaluation, planning, design, and supervision of construction for the purposes of assuming compliance with specification and design ...".[51] The basis of this type of approach is that the object of the architects' activities are structures, buildings, works or projects while the objects of the engineers' activities are the foregoing plus utilities, machines, equipment and processes. Such an approach can be seen to be similar to that taken in most Canadian statutes but the logic of parallel definitions is certainly not followed in Canadian legislative definitions. The study of American registration laws,nevertheless appears to confirm the approach of the Canadian statutes which opt for a legislative scheme of overlapping jurisdiction with reciprocity. It also appears to support the developing trend in the interpretation of the Ontario statutes;[52] a trend which appears to accept overlapping jurisdictions with reciprocity because of the difficulty of precisely delineating the two distinct fields of activity. The Report concludes in this matter:

> ... distinctions at least between architect and engineer are wholly artificial. If a court is compelled to set out lines of demarcation, there are limits in the language of the statutes (such as the application of certain kinds of scientific knowledge) on which a tortured distinction can be made. But the language is not self-revealing.[53]

It can be seen that in the United States the same difficulty has arisen in interpreting architecture and engineering acts. The courts have not been any more successful than the court was in R. v. Moll[54] in identifying the difference between architecture and engineering. Indeed the courts generally in the United States, have upheld the right of professional engineers to design public buildings and structures in those situations where the legislation provides for reciprocity.

The most recent case on the matter in the United States is the Georgia Association of the American Institute of Architects et al. v. Gwinneth County, Georgia[55] in which the Court held on the basis of statutes similar to those in Ontario that both engineers and architects could design fire halls. The Court noted that there may well be a difference between architecture and engineering in that engineers may not freely practise architecture but it could not discern such a distinction. In the case of State of Alabama v. Edward A. Jones, Jr.[56] the Court took the approach that there was a complete overlap in jurisdiction between the two professions with respect to building design and that either could engage in such practice. The Court concluded that even though there were separate legislative categories it was virtually impossible to distinguish on the basis of such categories between the practice of architecture and engineering. "Groping in this twilight zone to determine what is incidental to each profession presents questions impossible of any harmonious solution ... We think that in the background of the issues here presented, what architectural work is permissibly incidental to engineering; and visa versa, cannot be based on any percentage basis."[57]

These cases and others[58] support the view put forth in the American Law Reports that the overlapping nature of the two professions is well accepted in the United States:

> It has been recognized that there may be an overlapping of architectural and engineering services, that is, that the same services may in one instance constitute architectural services and in another instance engineering services. The courts generally conclude that where either a licensed architect or licensed engineer performed services which could be regarded as within the reach of the statute licensing his profession and also within the statute licensing the other profession, he performed such services under the statute under which he was licensed and was not affected by the fact that they came incidentally within the purview of the other licensing statute.[59]

The trend in American statutes and court decisions is clearly in the direction noted in Canada of providing overlapping jurisdiction with reciprocity. Indeed that trend appears to be more discernable in the United States with very few cases upholding an exclusive jurisdiction for each profession[60] and some statutes actually providing explicitly for common definitions. The most important cases upholding exclusive jurisdiction are <u>Fanning v. College of Steubenville</u>[61] and <u>Debham Construction Co. v. State Bd. Exam. & Reg. of Architects</u>.[62] The court's decision in the former case however was to a large measure based on the premise that "each profession must be protected in its own field of interest",[63] while the latter case was based on a statute which specifically required architects to design the building which the engineer had designed and thus was akin to the statutes of Manitoba and Saskatchewan.

F. THE POLICY QUESTION

The mere existence of trends in legislation and jurisprudence in Canada and the United States does not provide any definitive basis for deciding that legislation regarding the architectural and engineering professions should provide for a common area of jurisdiction between the two professions. It may be that public policy demands are such that in spite of these trends legislation should be provided that does segregate the two areas as the legislation in Saskatchewan and Manitoba attempt.[64] There are a number of issues which arise with respect to such a consideration however. First, it should be noted that if both legislatures and courts have had a great deal of difficulty in segregating jurisdiction and thus analyzing the roles of architects and engineers the need to provide for explicit definitions should be examined carefully. Of concern here is whether there are other legislative techniques to ensure any public policy goals served by providing exclusive jurisdiction. Secondly the actual roles of architects and engineers must be examined to ascertain if that difficulty in delineating exclusive areas of jurisdiction reflects the reality of practice. Thirdly, the use of schedules and detailed references as a legislative device and judicial tool must also be examined. Before undertaking an examination of these issues, however, the policy question of why exclusive jurisdiction should be provided, given an apparent trend against such an approach and given the reluctance of the courts in Canada and particularly in the United States to establish such exclusivity must be dealt with.

The reason suggested for exclusive jurisdiction for architects is that the public interest demands that building design be supervised by architects because an architect:

> receives specific training in the comprehension of engineering systems which covers the many aspects of structural, mechanical and electrical engineering work as it relates to buildings. The architect is trained to coordinate these systems so that they perform as a unified whole for the benefit of the building occupants.[65]

The need to ensure that occupants are protected by the provision to require the service of an architect in building design is discussed in part in Chapter III. That chapter indicates that in terms of clients seeking design services there is probably not a need for such a requirement as most clients are sophisticated enough to choose the kind of design advice required. This of course does not cover the specific needs of occupants and those who view buildings from the outside. Here, as mentioned in Chapter II. we are concerned with health and safety and the external form of buildings. In terms of some of these concerns other legislation provides for protection of the public interest directly. The Ontario Building Code[66] provides detailed regulation for use and occupancy, design, building services, and requirements for the handicapped. This public interest is generally agreed to be protecting the safety of occupants. While it does not cover all aspects of the design function it clearly can provide for the health and safety of occupants in the design process. It therefore covers one aspect of design.

The Building Code in Ontario is generally administered by municipalities[67] and thus a number of building officials in a variety of municipalities were interviewed respecting its administration. Interviews with building officials suggest the following conclusions:

> The building officials interviewed seemed generally to be knowledgeable and competent. In several cases, the writer was impressed by the expertise of the respondents (officials) and by the degree of their understanding of the wider issues involved ... Likewise the building departments seemed to be well organized to carry out their responsibilities ... In most cases the writer received the impression that the building officials interviewed were making a serious effort to enforce the O.B.C. fairly and honestly and more generally to improve the quality of building within their municipalities.[68]

On the other hand it should be noted that this study also indicates that in some municipalities the Code is not enforced vigorously, impartially or even honestly.[69] The detailed regulations in the Code itself therefore cannot be seen as the only appropriate device to ensure safety for the occupants of buildings. To correct such problems, however, administration of the Code could be improved by the province providing funds for its enforcement and/or by provincial administration of it. Nevertheless even if one could argue that the Code clearly provided for adequate protection regarding the health and safety function of design it is most difficult to segregate that function from the concern of a "unified whole which benefits the building occupants".

If the Code can be seen as an attempt to directly ensure health and safety, and thus can be seen as a method of ensuring healthy and safe buildings without requiring the services of an engineer, section 35(a) of The Planning Act[70] of Ontario can be seen as an attempt to ensure that an aesthetically pleasing building results from the design process.

This section not only enables municipalities to control external matters respecting buildings such as landscaping, lighting, elevation, and walkways[71] but also provides for municipalities to approve plans showing the location of all buildings and structures to be erected[72] and to approve perspective drawings and plans showing building elevations and cross-sections in commercial and industrial buildings and in residential buildings of over twenty-five dwelling units.[73] Such a provision clearly enables the public interest to be directly protected by ensuring the quality of the exterior designs of buildings. Municipalities moreover through their zoning powers are also able to effect control over the design of buildings by refusing to re-zone property until the plans for such a development are approved by council.[74] In such control there has been a practice of providing that municipalities can refuse developments on aesthetic grounds.[75]

The development control process thus is another method, rather than carving out exclusive jurisdiction for architects to design buildings, of ensuring that the external appearance of buildings is designed for the benefits of occupants and the wider public alike. A series of interviews with planning officials of various municipalities indicates that although most planning officials do not wish to design buildings themselves their major concern is to discourage design that is incompatable with the community.[76] As well, they see more activity in the future in this area of design control.[77] Moreover a recent report of the City of Toronto Planning Board on <u>The Development Review</u>

<u>Process</u>[78] states:

> In general the process has been successful in that it has given the City the opportunity to consider details of landscaping, compatability with adjoining buildings and adequacy of parking and loading provisions, and in many cases of requiring improvements in these areas. In addition land for highway and land improvements has been obtained as a result of the power confined by section 35(a) of <u>The Planning Act</u> of Ontario.[79]

The Report also notes that often negotiations occurred between applicants and their architects and the City that resulted in changes in design and the maintenance of existing building forms.[80]

The results of such a process of review are clearly inconclusive,[81] and cannot be seen as a method absolutely to ensure "good" design as by-laws for development control are optional under the Act and have not been passed throughout the province or even throughout individual municipalities in the province.

The existence of the building code and development control techniques however indicate that from the <u>public interest</u>[82] point of view a means is provided to define what protection or controls are desirable in the area of human safety and external aesthetics. It may be that the public will choose not to exercise those controls or to ensure their proper administration. To the extent that they are available, however, it means that in those two areas of design it is not necessary to <u>require</u> architectural or engineering input to provide that public interest, while in the third area of design indicated in Chapter II, the allocation of space, the public interest would appear more limited as this matter is really of concern to the client. The public interest here would appear to be only to ensure that clients know of the nature of the

professional they are engaging. If the clients of the design profession are sophisticated and can make such judgment as is suggested in Chapter III, there would appear to be little served by requiring the activities of architects or engineers in design through legislation regulating the professions.

In response to such a suggestion it may be argued that the requirement of exclusive jurisdiction for architects at least is essential because of a need to ensure "good architecture". It is further suggested that providing "good architecture" is the "central skill which justifies the existence of architects, that is their capability to produce satisfactory buildings and places."[83] Such an argument not only suggests that good architecture can be defined on the basis of standard definitions or detailed objective evaluation[84] but also that there is something distinct and separate from any other activity. The existence of engineering practices, building codes, and planning acts all call into question the latter view since they all have impact on the design process: architecture does not stand alone. The existing legislation moreover indicates that society is not willing to trust the architect to determine "good architecture" or perhaps, more importantly, indicates that there is no way to determine "good architecture" except by what is politically acceptable under the Code and Planning Act.[85]

The case study on the design of the central library in Toronto indicates in part that the design process is not the exclusive jurisdiction of the architect or engineer. That study indicates that in fact the ultimate design of the library was the result of the input of the client (the Library Board), the public, the engineers and the architect. The exterior design was in fact substantially changed as a result of public pressure from a neighbourhood group.

The design of the Brampton Correctional Centre was the responsibility of an engineering firm, Giffels Associates Ltd. but that allocation of responsibility does not appear to have affected the actual design of the building as it was to a large extent the responsibility of an architectural firm which is associated with Giffels. The most striking conclusion from the study appears to be that those architects and engineers involved viewed themselves as in a symbiotic relationship in which each interacted on the other. The task of separating such activity by legislation would seem extremely difficult. Moreover to the extent that the public impacted on the design of the library (there was virtually no public concern respecting the Correctional Centre) it would appear that its role in design too would be difficult to segregate and isolate.

In terms of the perspective of health and safety, and space allocation, the role of the architect was impossible to delineate clearly from that of the engineer in these projects. With respect to health and safety for example:

> it is apparent that while architects take into account the nature and requirements of the system ... it is the function of the engineers ... to elaborate on these systems ...[86]

While the accommodation of human activity was primarily the architect's responsibility there was extensive and continuous reliance on the work of the engineers,[87] and on the needs and views of the client.[88] As a result it can be suggested that in fact design is not one isolated act but rather a multi-faceted process in which the

architect, engineer, client and, in certain cases, the public are involved together. As such it is no one person's or profession's monopoly but will change and alter according to needs and circumstances. The result of such a situation clearly calls into question any attempt to create exclusive jurisdiction for architects or engineers in such a process.

Indeed, given such a process it would appear unwise to place legislative definitions or controls on it. Courts function best when they are able to decide matters based on set standards or principles in order to adjudicate a matter or dispute.[89] Any definition of design to allocate a task to architects or engineers would appear difficult to enunciate, because of the interdependent and complex nature of the process described above. Yet successful judicial control in this area will depend on viable standards which have not yet been found in the legislative examples surveyed. The one exception to this may be the statute in Manitoba which provided a list of certain buildings which only engineers could design. Such a list can be viewed as providing those standards. Yet even that schedule, in item six, refers to all buildings and structures necessary for the proper housing or operation of the works listed and any of the works mentioned could easily be housed in residential buildings. As a result the dispute is renewed. Moreover the attempt at allocating responsibility by a list by the two professional organizations in Ontario not only resulted in many buildings that both professions could design but also in a "grandfather" clause providing protection for those firms which were already active in an area of design deemed to be of the other profession.[90] But even if a list could be drawn up as one has been by the two professions in Ontario,

such a list, without clear standards as to why certain matters are in one category and not in another, means inflexibility and an inability to expand or add new items in any rational way because the rationale for the segregation is not clear. Moreover it does not seem clear why certain items which may be viewed as within the purview of engineers should also not include architectural input. The Chairman of the Department of Architectural Design at the Pratt Institute in Brooklyn, N.Y., wrote as follows:

> As Aristotle classifies it, architecture is a productive science; i.e., a science which is concerned with bringing into being a particular physical object, the building or other architectural work -- and accordingly, the premises of this science would be assumed from some 'higher' purely theoretical science. But what Aristotle may not have been aware of is that the term 'productive science' varies in both denotation and connotation with each historical period. The definitions of architecture that different social periods provide are indicative barometers of the social climate as well as of the buildings erected.
>
> A more general, and to the contemporary mind more satisfying, definition would be that architecture deals with enclosed spaces for social usages. It is the construction of volumes, to protect man against nature, in which man can perform various social functions. Such volumes as houses, churches, factories, etc., may fall into the category of architecture. But it can also include such historical structures as Stonehenge, Roman archways and sealed temples. Such contemporary structures, while not clearly enclosed spaces, as bridges and dams are also part of our subject matter. Indeed, much of the controversy on the connotation of contemporary architecture centers around these subjects.
>
> In conclusion, architecture and building cannot be clearly separated; except that architecture, having as its base an intent toward art, usually produces structures that have a more adequate visual satisfaction than building. It is, at most, a relativist and empirical scale but it is our only one. (emphasis added).[91]

The comment suggests not only the overlapping functionsof architecture, and engineering, but also that architects should be performing functions common to engineers although no legislative definitions in Canada are wide enough to permit such activity. Nevertheless the suggestion that contemporary architecture may well include dams and bridges brings to mind a concern that indeed architects may be too narrowly restricted in the scope of their work.

The use of the list technique would not seem appropriate, therefore, because of its inflexibility and inherent arbitrariness in not providing criteria for allocation. It may well be that the allocation of roles in the design process is not a justiciable issue[92] in that it involves a process which is inherently unsuited for adjudication. It appears impossible to elaborate a reasoned decision in allocating exclusive functions. Fuller suggests that problems which cannot be decided by the application of principles are often polycentric and may be described as managerial or allocative.[93] This suggestion would seem to apply to the allocating of roles to architects and engineers. We saw in the case studies, as mentioned, a great deal of interdependency in the design process. Indeed the nature of ultimate design to a large extent appears to be a function of the roles of those involved in it so that any definition may have important consequences in the outcome of the process. More importantly however the issue faced in the jurisdictional question is who shall be able to operate in certain fields of endeavour and who shall not. There are no principles discernable in the legislative definitions or the cases decided on those definitions which can give rational answers to that problem. The only definitions

and cases which have appeared suitable indeed are those which suggest that both professions should have such an ability because indeed the work of each overlaps with the other.

Moreover, from a broader policy point of view the concept of parallel authority in design seems appropriate. The difficulty with segregation has been noted but in addition it is clear that the concept of dual responsibility in design has been recognized. The Ontario Building Code for example requires that buildings used or intended for assembly occupancy, institutional occupancy or a building exceeding 6,000 square feet or three stories in height intended for residential occupancy, business and personal services occupancy, mercantile occupancy or industrial occupancy must be designed by an architect or engineer, or a combination of both.[94] In addition where such a building is designed the architect or engineer shall be responsible for the field review of the building during the course of construction.[95] There is no attempt in the Code to differentiate between the two professions even though one might argue that the Code with its concern for safety should give preference to the engineers. The overlap of the two professions is recognized in this legislation.

Similarly municipalities have recognized the overlap between the two professions. For example, the Form of Standard Development Agreement in the Town of Burlington[96] which, as mentioned, is entered into in order to ensure adequate design of new developments in the municipality specifies that "all buildings shall be designed by an architect or engineer specializing in architecture ...". It is interesting to note as well that in the United States the standard terminology and practice of all the major federal construction agencies (military service,

Veterans Administration, general service administration, atomic energy, etc.) is to designate all design contracts for all types of facilities, buildings included, as architect-engineer contracts.[97] Moreover, in August, 1962, the United States Civil Service Commission abolished its separate classification series for architects and architectural engineering and incorporated them within the Engineering Group. In explaining this action the Commission stated:

> From our occupational study of this area we concluded that separate series for Architecture and Architectural Engineering represented an unnecessary fragmentation of this profession. The existing distinctions in functional areas of work were artificial, and served merely to limit or impede the Federal Government in its use of the skill and talents of its people. While members of this profession may differ somewhat in educational background and the title of the degree they receive, as time goes on and they progress in their profession, they come so close together as to be essentially in one profession.[98]

This view of overlap would appear to be confirmed in the economic study in Chapter II where although architects and engineers had different specialities, engineers and architects both had experience in interior layout and building space layout and did not have exclusive claims of expertise but rather had a mixture and overlap in expertise.[99] The existence of mixed firms also goes to show the overlap in the professions as does the footnote added to the agreement worked out between the Ontario Association of Architects and the Association of Professional Engineers of Ontario which stipulated that architectural or engineering firms with a demonstrated competence in building design related to "architectural" or "engineering" projects and employing the requisite registered or licensed architects and engineers may act as prime consultants on such projects.

G. CONCLUSION

It would appear that from the point of view of existing legal practice and tradition the approach of reciprocity between the two professions is most prevalent in North America. Although such a practice does not in any way mandate that that situation,continue it would appear to indicate that such an approach is most acceptable to the courts. In addition it is clear that this approach is more suitable for judicial and administrative decision-making as there is little by way of standards to apply to segregate the practice of architecture and engineering in the designing of buildings. The use of a schedule allocating the various buildings that each profession can deal with would appear to be an inflexible approach without the ability to rationally allocate such buildings and an approach which is outmoded; because of the suggestions that: there are buildings which both professions can design; there is need for protecting firms already operating in the field of the other profession; and such problems can be circumvented by engineering and architectural firms associating with each other as in the case of Giffels in the design of the Correctional Centre.

It is suggested, therefore, on both the grounds of legal policy respecting legislating such matters and on the grounds of public policy which should recognize the professional overlap and other methods of protecting the public interest that the legislation governing architects and engineers in Ontario not be amended to attempt to provide any exclusive jurisdiction for either profession. The overlap is recognized by the

present legislation and by the Divisional Court in interpreting that legislation and should continue.

If any move is made towards amendment it would therefore seem appropriate to proceed in the direction of providing for a broader and clearly overlapping definition for the professions. The California Code provides for such a definition:

> A person engages in the practice of building design within the meaning and intent of this chapter, who holds himself out as able to perform or who does perform any service which requires or would require the application of the skills necessary for designing buildings and their related sites and facilities, and includes the preparation of customary instruments of service such as drawings and specifications and supervision of construction insofar as is customarily performed by building designers.[100]

It should be noted, however, that this is merely a definition used to prevent people from holding themselves out as architects, engineers or landscape architects. In all jurisdictions examined, including California, there was separate registration of both architects and engineers although not through bodies composed of architects and engineers elected by those respective professions.[101] There has been no real recognition of a design profession as such, therefore. There are no examples of where the requirements for entrance to the architecture and engineering professions are identical although as mentioned earlier there are, as in Alaska, parallel definitions of architecture and engineering. The Architects Association of New Brunswick Act makes reference to a Design Profession,[102] but still provides for separate registration, accreditation and definitions of architecture and engineering.

Care should be taken in any such move towards a broader definition to provide for the practice of technologists in either the architecture or engineering fields as is presently provided in legislation. That protection exempts persons from practising in the profession when under the supervision of a professional and appears to be general enough to provide for the various levels of competency among technologists. In addition, any broader definition must be certain to enable landscape architects and planners and indeed all those presently exempted under legislation to function within their areas of expertise without any adverse legal effect.

More importantly, perhaps, attention should be paid to the concern that perhaps the role of architects is presently too narrowly restricted. Any movement to a new definition of professional activity should not provide for a very narrow scope of architecture. Moreover, although it is suggested that no amendment need be made to the present Ontario Act to resolve the jurisdictional dispute that presently exists it should be noted that a wider, although not exclusive, definition of architecture might be considered and that it may be desirable to amend the Acts to make clear the reciprocal nature of the practice of the professions.

None of these arguments, however, means that the holding out provisions of the statutes should be removed. It would still seem appropriate to require correct information as to the professional qualifications of those in the design profession.

TABLE IV.G.1

Legislative Summary

	The Architectural Profession Act, R.S.B.C. 1960 c. 16 as amended by S.B.C. 1976 c. 33.	Engineering Profession Act S.B.C. 1960 c. 128.
British Columbia		
Definition	2. In this Act, unless the context otherwise requires, "architect" means a person who is engaged in the planning or supervision of the erection, enlargement, or alteration of buildings for persons other than himself; but does not include any draughtsman, student, clerk of works, superintendent, or other employee of a registered architect, nor any superintendent of buildings paid by the owner thereof acting under the directions and control of a registered architect; "building" means a structure consisting of foundations, walls, or roof, with or without other parts; "licensee" means a person to whom a licence has been issued under this Act. 1955, c. 4,s.2.	"practice of professional engineering" means the carrying-on of any branch of chemical, civil, electrical, forest, geological, mechanical, metallurgical, mining, or structural engineering, including the reporting on, designing, or directing the construction of any works which require for their design, or the supervision of their construction, or the supervision of their maintenance such experience and technical knowledge as are required by or under this Act for the admission by examination to membership in the Association, and, without restricting the generality of the foregoing, shall be deemed to include reporting on, designing, or directing the construction of public utilities, industrial works, railways, bridges, highways, canals, harbour-works, river improvements, lighthouses, wet docks, dry docks, floating docks, launch-ways, marine-ways, steam-engines, turbines, pumps, internal-combustion engines, airships and aeroplanes, electrical machinery and apparatus, chemical operations, machinery, and works for the development, transmission, or application of power, light, and heat, grain-elevators, municipal works, irrigation-works, sewage-disposal works, drainage-works, incinerators, hydraulic works, and all other engineering-works, and all buildings necessary to the proper housing, installation, and operation of the engineering-works embraced in this clause; but the execution as a contractor of work designed by a professional engineer, the supervision of construction of work as foreman or superintendent or as an inspector, or as a roadmaster, trackmaster, bridge or building master, or suprintendent of maintenance, shall not be deemed to be the practice of professional engineering within the meaning of this Act;
Prohibition	56(1) No person or corporation who is not either registered as a member of the Institute under this Act or the holder of a current temporary licence issued under this Act shall practise or offer to practise the profession of architecture.	19(1) Save as in this Act otherwise provided, no corporation shall engage in the practice of professional engineering within the Province nor use the title "professional engineers" or any abbreviation thereof; nor, save as in this Act otherwise provided, shall any person engage in the practice of pro-

(2) A person shall be deemed to practise the profession of architecture within the meaning of this Act who

(a) is engaged in the planning or supervision of the erection, enlargement, or alteration of buildings for persons other than himself;

(b) by advertisement, sign, or statement of any kind, written or verbal, alleges or implies that he is, or holds himself out as being, qualified, able, or willing to do any of the acts set out in clause (a), or that he is an architect.

57. No person shall erect, enlarge, repair, or alter any building, or cause any building to be erected, enlarged, repaired or altered, in accordance with plans and specifications prepared or approved by any person or corporation in contravention of the provisions of section 56. 1955, c. 4, s. 57.

59.(1) Save as in this Act otherwise provided, no person not registered under this Act as a member of the Institute shall use or hold himself out under the title "architect" or any like title or description, or take, use, or advertise, or hold himself out under any name, title, addition, or description implying, or calculated or likely to lead the public to infer, that he is registered under this Act.

(2) No person not licensed under this Act shall take, use, or advertise, or hold himself out under any name, title, addition, or description implying, or calculated or likely to lead the public to infer, that he is licensed under this Act. 1955, c. 4, s. 59.

fessional engineering within the Province nor use the title "professional engineer" or any abbreviation thereof unless he is a member of the Association and holds a certificate of registration as provided in this Act or is duly licensed under the provisions of this Act.

(2) Save as in this Act otherwise provided, a corporation or any person who, without being a member of the Association and registered or licensed under this Act,

(a) engages in the practice of professional engineering; or

(b) usurps the function of a professional engineer; or

(c) assumes, verbally or otherwise, the title of professional engineer, or advertises or uses, or permits to be advertised or used, in any manner whatsoever, in connection with his name or otherwise, any word, name, title, or designation mentioned in the definition of "practice of professional engineering", or any combination or abbreviation thereof, or any other word, name, title, designation, descriptive term, or statement implying, or calculated to lead any other person to believe, that he or it is a professional engineer, or is ready or entitled to engage in or is engaged in the practice of professional engineering as defined in section 2 of this Act; or

(d) acts in such manner as to lead any person to believe that he or it is authorized to fill the office of or acts as a professional engineer; or

(e) advertises, uses, or displays any sign, card, letter-head, or other device representing to the public that he or it is a professional engineer, or a person or corporation entitled to engage in the practice of professional engineering, or holds himself or itself out to the public to be a professional engineer,

		is guilty of an offence and liable, on summary conviction, to a penalty of not less than twenty-five dollars but not exceeding one hundred dollars for the first offence, and a penalty of not less than twenty-five dollars but not exceeding five hundred dollars for every subsequent offence. 1955, c. 22, s. 19. 20. A person who or corporation which advertises or uses, in any manner in connection with a person who is not a member of the Association or the holder of a licence from the Council, the title of "professional engineer" or any word, name, title, or designation mentioned in the definition of "practice of professional engineering" or any combination or abbreviation thereof, or any other word, name, title, designation, descriptive term, or statement implying or calculated to lead any other person to believe that such person or corporation is a professional engineer, or is ready or entitled to engage in or is engaged in the practice of professional engineering as defined in section 2, is guilty of an offence and liable, on summary conviction, to a penalty of not less than twenty-five dollars but not exceeding one hundred dollars for the first offence, and a penalty of not less than twenty-five dollars but not exceeding five hundred dollars for every subsequent offence. 1955, c. 22, s. 20.
Reciprocity	56(3) This section does not apply so as to prevent (a) a person who is registered as a professional engineer under the Engineering Profession Act from practising professional engineer or from doing any of the acts set out in clause (b); (b) a chemical, civil, electrical, forest, geological, mechanical, metallurgical, mining, or structural engineer from carrying on the work of designing or supervising the building, remodelling, or repairing of a structure usually designed or supervised as to construction, alteration, or repair by such engineer;	3(1) Nothing in this Act shall be so construed as to prevent a person registered as an architect under any Act of the Province relating to the practice of architecture from practising the profession of architecture or to require him to be registered under this Act where the practice of such person is confined to architecture; and nothing in this Act applies to a British Columbia or Dominion land surveyor practising his profession, except that such land surveyor shall not style himself nor hold himself out as a professional engineer unless he is registered or licensed under the provisions of this Act.

British Columbia ...4.

58. Nothing in this Act requires the registration of a person registered as a professional engineer under any Act of the Province relating to the practice of engineering where the professional practice of the person is confined to professional engineering. 1955, c. 4, s. 58.

	The Architects Act, R.S.A. 1970 c. 22	Engineering and Related Professions Act R.S.A. 1970 c. 124.
Alberta Definition	2. In this Act, (a) "architect" means any person who is engaged for hire, gain or hope of reward in (i) the planning, designing or supervision of, or (ii) the supplying of plans, drawings or specifications for, the erection, construction, enlargement or alteration of buildings, for persons other than himself, but does not include any person employed by a registered architect as a draftsman, student clerk of works, superintendent or in any other similar capacity, nor any superintendent of buildings paid by the owner thereof and acting under the directions and control of a registered architect;	2. (k) "professional engineering" means reporting on, advising on, evaluating, designing of, preparing of plans and specifications for, surveying for, or directing the construction, the technical inspection, the maintenance or the operation of any structure, work or process (i) that is aimed at the discovery, development or utilization of matter, materials or energy, or in any other way designed for the use and convenience of man, and (ii) that requires in the reporting, advising, evaluating, designing, preparation, surveying or direction, the professional application of the principles of mathematics, chemistry, physics or any related applied subject including, without limiting the generality of the foregoing properties of materials, mechanics of solids and fluids, thermodynamics, electronics and the like, but does not include the execution or supervision of the construction, technical inspection, maintenance or operation of any such structure, work or process in the capacity of contractor, superintendent, foreman or inspector or in any similar capacity, when the structure, work or process has been designed by and the execution or supervision is being carried out under the responsible supervision of a professional engineer;
Prohibition	21.(1) Notwithstanding any provision to the contrary in an Act, or in an ordinance or any by-law of a city, town, village or other local authority, no plans, drawings or specifications for the erection, enlargement or alteration of	9. No person except a member or licensee or permit holder shall (a) engage in or offer to engage in any of the activities of professional engineering, professional geology or professional geophysics, or

(a) any apartment or residential building containing five or more dwelling units, or

(b) any hotel or similar occupancy containing 11 or more guest rooms for transient or permanent occupancy, or

(c) any commercial or industrial building or combination of the same with other occupancies of which the aggregate area of all floors exceeds 5,000 square feet, or

(d) any one storey building to be used for public assembly wherein

(i) the total occupant load exceeds 300 people,

(ii) the gross area exceeds 3,000 square feet, and

(iii) the unsupported span exceeds 30 feet, or

(e) any building of more than one storey to be used for public assembly where the gross area exceeds 2,500 square feet, or

(f) any building with a capacity of over 12 beds, to be used as a hospital, sanatorium, or home for the aged, other than a veterinary hospital, or

(g) any school building containing more than three rooms for the teaching of general or special subjects, or containing a gymnasium or auditorium, or

(h) any other building of which the aggregate area of all floors exceeds 5,000 square feet, or of any addition or alteration to an existing building that would place the same within any of the above categories,

(b) use, orally or otherwise, the title "professional engineer", "professional geologist" or "professional geophysicist" or any abbreviation thereof, or

(c) use, orally or otherwise, any name, title, occupational designation or position description in which the term "engineer", "geologist" or "geophysicist" appears or use any abbreviation of these names, titles, designations or descriptions in a manner that would lead to the belief that he is a professional engineer, professional geologist or professional geophysicist or that he is a person qualified to practise professional engineering, professional geology or professional geophysics, or

(d) advertise himself or hold himself out as a professional engineer, professional geologist or professional geophysicist in any way or by any means, or

(e) act in such a manner as to create or induce in the mind of any reasonable person the belief that he is authorized to fulfill the office of or to act as a professional engineer, professional geologist or professional geophysicist. [1968, c. 25, s. 9]

shall be passed, approved or accepted by any authority appointed to pass, approve or accept such plans, drawings or specifications, unless the plans, drawings or specifications have been approved and signed by a registered or licensed architect.

(2) Notwithstanding anything contained in a municipal by-law, regulation or order, no person shall require any plans, drawings or specifications, other than those of such buildings as are specifically mentioned in subsection (1), to be approved and signed by a registered or licensed architect.

(3) Subsection (1) does not apply to plans, drawings or specifications that have been prepared or approved by a department of the Government of Alberta for the erection, enlargement or alteration of any building.

Reciprocity

22. Nothing in section 21 applies to a person registered as a professional engineer under The Engineering and Related Professions Act, where the practice of that person is confined to engineering, but he shall not style or hold himself out as an architect unless he is registered or licensed under this Act.

10. Nothing in section 9 or section 13, 14 or 15 applies

(a) to a person registered as an architect under any Act of the Legislature relating to the practice of architecture where the practice of that person is confined to architecture, or

(b) to a person registered as a land surveyor under any Act of the Legislature or of the Parliament of Canada relating to the practice of land surveying or practising as a mine surveyor, where in either case the practice of that person is confined to the activities of a land surveyor or mine surveyor, or

(c) to a member of the Canadian Forces while actually employed on duty with the Forces,

except that an architect, land surveyor, mine surveyor, or member of the Canadian Forces shall not style or hold himself out as a professional engineer, professional geologist or professional geophysicist, unless he is a member or licensee of the Association. [1968, c. 25, s. 10]

New Brunswick

Definition

<u>Architects Association of New Brunswick Act</u>, S.N.B. 1970 c. 52 as amended S.N.B. 1975 c. 73

3(b) "The practice of architecture" means and includes the planning, designing or supervision of the erection, construction, enlargement or alteration of buildings of any kind or nature, but does not include such work when done by a draughtsman, student,clerk of works, superintendent or other employee of a registered architect nor a superintendent of buildings paid by the owner thereof and acting under the direction and control of a registered architect;

(1) "Design Professions" includes persons registered or licensed to practise architecture or engineering in the Province as well as persons duly qualified in the fields of landscape architecture, town planning, environment planning, interior design and related professions but does not include draughtsmen. Any dispute with respect to the meaning of the expression "design professions" shall be referred to the Council whose decision shall be final.

<u>Engineering Professions Act</u>, S.N.B. 1974 c. 18

1(1)(e) "Engineering is the application of scientific principles and knowledge to practical ends as the investigation, design, construction, or operation of works and systems for the benefit of man;

1(2) Without restricting the generality of the foregoing, the term "practice of engineering" within the intent of this Act, shall mean the provision of services for another as an employee or by contract; and such services shall include consultation, investigation, evaluation, planning, design, responsible supervision, management, research and development of engineering works and systems and the teaching of advanced level courses in any branch of engineering applicable to such works and systems but does not include services by other technical personnel whose work is being carried out under the ultimate responsibility of a professional engineer (engineer).

(3) Without restricting the generality of the foregoing, engineering works and systems shall include

(a) transportation systems and components related to air, water, land or outer space; movement of goods or people;

(b) works related to the location, improvement, control and utilization of natural resources;

(c) works and components of an electrical, mechanical, hydraulic, aeronautical, electronic, thermic, nuclear, metallurgical, geological or mining character and others dependent on the utilization of the application of chemical or physical principles;

(d) works related to the protection, control and improvement of the environment including those of pollution control, abatement and/or treatment;

		(e) the structural, electrical, mechanical, communications, transportation and other utility aspects of building components and systems; (f) structures and enclosures accessory to engineering works and intended to support and/or house them. (4) A person shall be construed to practise or offer to practise engineering within the meaning or intent of this Act, who practises any branch of the profession of engineering; or who, by verbal claim, sign, advertisement, letterhead, card, or in any other way represents himself to be an engineer or through the use of some other title implies that he is an engineer or that he is registered under this Act, or who holds himself out as able to perform, or who does perform, any engineering service or work or any other service designated by the practitioner which is recognized as engineering.
Prohibition	26. Any person who, not being a registered or licensed architect in New Brunswick, or being suspended or having been expelled under the procedings of the next preceding section, (a) practises architecture; or (b) uses the title of Architect or makes use of any abbreviation of any such title or of any name, title or designation which may lead to the belief that he is an Architect or a member of the Association; or (c) advertises himself as such in any way or by any means; or (d) acts in such manner as to lead to the belief that he is authorized to fill the office of or to act as an Architect.	15(1) Every person, other than a member or a licensee, who, (a) takes and uses orally or otherwise the title or designation "Engineer", "Professional Engineer", "Registered Professional Engineer", or "Licensed Professional Engineer", or uses any addition to or abbreviation of such titles, or any words, name or designation with the intent that such use will lead to the belief that such person is a member or a licensee; (b) advertises, holds himself out, or conducts himself in any way or by any means as a member or a licensee; or (c) engages in the practice of engineering; is guilty of an offence.

New Brunswick ... 3.

Reciprocity

32. Notwithstanding anything contained in the Engineering Profession Act, any person registered as an architect under the provisions of this Act shall be entitled in the practice of architecture to design, lay out and supervise such engineering works as are ordinarily incidental to the erection, construction, enlargement or alteration of buildings (including factories and other industrial buildings) and to design, lay out and supervise the construction, enlargement, alteration, improvement and repair of factories and other industrial buildings.

39. Nothing contained in this Act, shall be taken or construed to prohibit or preclude any engineer, who is registered under the provisions of the Engineering Profession Act, from legally carrying on, performing or doing architecture in connection with his work as an engineer.

See s. 32 of the Architects Association of New Brunswick Act S.N.B. 1970 c. 52 as amended S.N.B. 1975 c. 73.

	The Newfoundland Architects Act R.S. Nfld 1970 c. 253.	Newfoundland Engineering Profession Act R.S. Nfld. 1970 c. 258 amended S. Nfld. 1975.
Newfoundland		
Definition		1.(m) "professional engineer" means a person who, by reason of his knowledge of mathematics, the physical and social sciences and the principles of engineering, is qualified to engage in the practice of professional engineering and who is registered as a professional engineer under the provisions of this Act; (n) "professional engineering" means such professional services as consultation, investigation, evaluation, planning, research design and responsible supervision or any of them of construction or operation in connection with all utilities, structures, industrial works, communication systems including vehicles, transportation systems including vehicles, power transmission systems, heating, ventilating, air conditioning and other mechanical systems, chemical and metallurgical processes, computation systems, environmental control systems, resource systems and all other works or services requiring the application of engineering principles whether in the public or private sector, including but not limited to railways, tramways, bridges, tunnels, highways, roads, canals, harbour works, lighthouses, river improvements, wet docks, dry docks, floating docks, dredges, cranes, drainage works, irrigation works, water works, water purification plants, sewerage works, sewerage disposal works, incinerators, hydraulic works, electric power plants, electric machinery, nuclear plants, electric and electronic apparatus, mining machinery, mining structures, smelters, refineries, and related equipment and apparatus, pressure vessels, heating, ventilating and air conditioning equipment, boilers and their auxiliaries, steam engines, hydraulic turbines, pumps, internal combustion engines and other mechanical equipment, chemical and metallurgical machinery and apparatus, aircraft, the engineering works and installation relating to buildings, airports, airfields, and landing strips, town and community planning;";

Newfoundland ...2.

Prohibition

26.(1) Every person who, not being a member of the Association, or who, having been a member, has had his membership cancelled or is under suspension or who not being licensed under Section 9, applies to himself the term "architect" alone or in combination with any other term or who holds himself out as an architect, shall be guilty of an offence and liable on summary conviction to a penalty not exceeding one hundred dollars and in default of payment to imprisonment for a term not exceeding one month.

20. Any person, not a member or licensed to practise, or whose certificate of registration or licence to practise has been suspended or cancelled under the provisions of this Act who

(a) practises professional engineering;

(b) uses orally or otherwise the title of professional engineer or any abbreviation of such title, or any name, title, description or designation, including except as permitted by Section 10, the title or designation "Engineer" or "Engineering" in such a manner as may lead any person to believe that such person is a professional engineer, a member of the association, licensee, or entitled to practise professional engineering; or

(c) advertises, holds out or conducts himself in any way implying or leading any person to believe that such person is a professional engineer, a member of the association, licensed to practise, or entitled to practise professional engineering

is guilty of an offence and liable upon summary conviction to a fine of not less than one hundred dollars nor more than two hundred dollars and costs, and on failure to pay the same, to imprisonment for not more than three months for the first offence, and for any subsequent offence to a fine of not less than two hundred dollars nor more than five hundred dollars and costs, and on failure to pay the same to imprisonment for not more than six months.

Reciprocity

26(2) Nothing in this Act shall prevent or be deemed to prevent

(b) any member or licensee of the Association of Professional Engineers of the Province of Newfoundland under The Professional Engineers Act or any employee or person working under the responsibility of such member or licensee from performing architectural services in the course of any work undertaken or proposed to be undertaken by such member or licensee as an engineer.

10. The provisions of this Act do not apply to any person

(b) who, being an architect, practises the profession of and confines his practice to architecture, or, being a provincial or dominion land surveyor, practises the profession of surveyor, and confines his practice to surveying; except that such architect or surveyor shall not style himself nor hold himself out as a professional engineer unless he is registered or licensed under the provisions of this Act.

Nova Scotia	Architects Act, R.S.N.S. 1967 C 13 as amended S.N.S. 1975 c. 41.	Engineering Profession Act, R.S.N.S. 1967 c. 90.
Definitions	1. In this Act, unless the context otherwise requires, the expression: (b) "building" includes an assembly of two or more of the following components namely, foundation, structural frame, floor, wall and roof with or without plumbing, heating, or electrical systems, ventilating or air conditioning equipment and other parts and any part of a building, whether finished or unfinished;	1(h) "engineering" means the science and art of designing, investigating, supervising the construction, maintenance or operation of, making specifications, inventories or appraisals of, and consultations or reports on: machinery, structures, works, plants, mines, mineral deposits, processes, transportation systems, transmission systems and communication systems or any other part thereof;
Prohibition	41. No one shall practise architecture, take or use the title of architect or hold himself out to be an architect unless: (a) he is a practising member of the Association and registered as such; or (b) he is the holder of a valid temporary or special license to practise architecture issued by the Council. 42. (1) Subject to Section 18 a person shall be deemed to practise architecture if he does any one of the following acts for fees, commission or hope of reward: (a) offers to, agrees to, or does design a building for any other person; (b) consults with any person for the purpose of preparing a design of any building; (c) prepares for or delivers to any other person any graphic or written document, plan or specifications expressing a design for a building.	19. Any person, not a member or licensed to practise, or whose certificate of registration or license to practise has been suspended or cancelled under this Act, who, (a) practises professional engineering; or (b) uses verbally or otherwise the title of professional engineer or any abbreviation of such title, or any name, title, description or designation that may lead any person to believe that such person is a professional engineer, a member of the Association, licensed to practise, or entitled to practise professional engineering; or (c) advertises, holds out or conducts himself in any way implying or leading any person to believe that such person is a professional engineer, a member of the Association, licensed to practise, or entitled to practise professional engineering; shall be liable upon summary conviction to a fine of not less than one hundred dollars nor more than two hundred dollars and costs, and on failure to pay the same, to imprisonment for not more than three months for the first offence, and for any subsequent offence to a fine of not less than two hundred dollars nor more than five hundred dollars and costs, and on failure to pay the same, to imprisonment for not more than six months. R.S., c. 85, s. 19.

Nova Scotia ... 2.

(2) A person who is employed as a specialized consultant to advise any owner concerning any proposed building for the design of which an architect has been or is to be engaged is not deemed to practise architecture while carrying out these specialized consultant's services for which he is employed.

Reciprocity

Sections 41 and 42 shall not apply to ...

(b) a professional engineer while practising or applying engineering under the Engineering Professions Act ...

The Architects Act R.S.M. 1970 c. A130

Manitoba

Definition 2(1) In this Act,

(a) "architect" means any person who is engaged for hire, gain, or hope of reward in the planning or supervision for others of the erection, enlargement, or alteration of buildings by persons other than himself;

The Engineering Professions Act R.S.M. 1970 c. E120

(g) "practice of professional engineering" or "practice of engineering" means the carrying on for hire, gain, or hope of reward, either directly or indirectly, of one or more of the following branches of the science of engineering; namely, chemical, or civil, or electrical, or forest, or mechanical, or mining, or geological, or metallurgical, or structural, or such other branch as hereafter may be recognized and adopted by by-law of the association as a branch of engineering; and, without restricting the generality of the foregoing, includes the reporting on, advising on, valuing of,measuring for, laying out of, designing of, engineering inspection of, (including the direction or supervision of any of the foregoing), directing of, or supervising of, any of the works or processes set forth in Schedule A, or the construction, alteration, improvement, or enlargement, of them or any of them, or of any such works or processes omitted therefrom that are similar to those set forth in Schedule A, by reason of their requiring, in connection with any of the operations above set forth, the skilled or professional application of the principles of mathematics, physics, mechanics, aeronautics, hydraulics, electricity, forestry, chemistry, geology, or metallurgy; but does not include the operation, execution, or supervision, of works as superintendent, foreman, inspector, road master, track master, bridge master, building master, or contractor, wherever such works have been designed by and are constructed under the responsible supervision of a professional engineer.

SCHEDULE A

1. Transportation work, roads, railways, waterways, and all detail works connected therewith, such as bridges, tunnels, yards, docks, light-houses, rolling stock and vessels, also aeroplanes, airships and airports.

Manitoba ... 2.

	Architects	Engineers
		2. Public utility works, such as telegraph systems, telephone systems, electrical generation, transmission and distribution systems, water works, gas works, irrigation works, drainage works, sewerage works, and incinerators, and all other engineering works. 3. Mechanical works, such as steam boilers, engines, turbines, condensers, pumps, internal combustion engines, and other motive power machinery and accessories. 4. Electrical machinery and apparatus and works for the development, transmission, and application, of all forms of electrical energy. 5. Mining and metallurgical works, such as mining properties, mine and concentrator machinery and apparatus, oil and gas wells, smelters, cyanide plants, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the economical winning or preparation of metals, minerals, oils or gases. 6. All buildings and structures necessary for the proper housing or operation of the above-mentioned works. 7. The mechanical, electrical, chemical, electro-chemical, mining, or metallurgical treatment of the inorganic elements and combinations thereof for all industrial purposes. 8. Investigations relating to the examination, exploration, and development, of rocks and minerals, mineral deposits, rock structures, oil and gas structures, and the application of geology to the industries or arts or to engineering.
Prohibition	16(1) No person or firm is entitled to practise as an architect in Manitoba, or to take or use in Manitoba the designation "architect" or	28. Save as in this Act otherwise provided, no person shall (a) engage in the practice of professional engineering; or

Manitoba ... 3.

"architects", either alone or in combination with any other words or any name, title, or description, implying that he or they is or are an architect or architects, unless the person or each member of the firm is a member of the association in good standing and registered as such.

(b) assume verbally or otherwise the title "professional engineer", or any abbreviation thereof, or any name, title, designation, or descriptive term, that may lead any other person to believe that he is a professional engineer or entitled to engage in the practice of professional engineering; or

(c) act in such a manner as to lead to the belief that he is authorized to fulfil the office of, or to act as, a professional engineer; or

(d) advertise, list, display, or use, at any time or in any manner, or permit to be used, at any time or in any manner, in connection with his name, any name, title, designation, or descriptive term, implying, or calculated to lead any other person to infer, that he is registered under this Act or entitled to engage in the practice of professional engineering;

unless he is registered under this Act and is a member of the association or is the holder of a subsisting licence granted under this Act.

Reciprocity

36. Nothing in this Act applies to anyone registered as an architect under any Act of the Legislature relating to the practice of architecture if the practice of that person is confined to architecture; and nothing in this Act applies to any Manitoba or Dominion land surveyor practising his profession, except that such a surveyor or architect shall not style or hold himself out as a professional engineer unless he is registered or licensed under this Act.

	Legislation Regarding Architecture	Legislation Regarding Engineering
P.E.I.	Architects Act, R.S.P.E.I. 1974 c. A-16	Engineering Professions Act, R.S.P.E.I. 1974 c. E-6
Definition	2(b) "building" includes an assembly of two or more of the following components namely: foundation, structural frame, floor, wall and roof with or without plumbing, heating, or electrical systems, ventilating or air conditioning equipment and other parts and any part of a building, whether finished or unfinished;	2(h) "engineering" means the science and art of designing, investigating and supervising the construction, maintenance or operation of, and making specifications, inventories or appraisals of, and consultations or reports on, machinery, structures, works, plants, mines, mineral deposits, processes, transportation systems, transmission systems and communication systems or any part thereof;
Prohibition	42(1) Subject to section 19 a person shall be deemed to practise architecture if he does any one of the following acts for fees, commission or hope of reward: (a) offers to, agrees to, or does design a building for any other person; (b) consults with any person for the purpose of preparing a design of a building; (c) prepares for or delivers to any other person any graphic or written document; plan or specifications expressing a design for a building; or (d) coordinates the work of more than one architect or an architect together with a professional engineer, a landscape architect, an interior designer or specialized consultant for the design of a complex of buildings. (2) A person who is employed as a specialized consultant to advise any owner concerning any proposed building for the design of which an architect has been or is to be engaged is not deemed to practise architecture while carrying out these specialized consultants' services for which he is employed. 1972, c. 54, s. 41.	20. Any person, not being a member or licensed to practice, or whose certificate of registration or license to practise has been suspended or cancelled under this Act, who (a) practises professional engineering; (b) uses verbally or otherwise the title of professional engineer or any abbreviation of the title,or any name, title, description or designation that may lead any person to believe that the person is a professional engineer, a member of the Association, licensed to practise, or entitled to practise professional engineering; or (c) advertises, holds out or conducts himself in any way implying or leading any person to believe that such person is a professional engineer, a member of the Association, licensed to practise, or entitled to practise professional engineering; is guilty of an offence and liable upon summary conviction to a fine of not less than one hundred dollars nor more than two hundred dollars and costs, and on failure to pay the same, to imprisonment for not more than three months for the first offence, and for any subsequent offence to a fine of not less than two hundred dollars nor more than five hundred dollars and costs, and on failure to pay the same, to imprisonment for not more than six months. 1955, c. 43, s. 20.

P.E.I. ...2.

43. A person shall be deemed to take or use the title of "architect" or hold himself out to be an architect if he does any one of the following acts:

(a) advertises that he is an architect either singly or in connection with any other word, name, title or designation except as a naval architect or a landscape architect;

(b) subject to sections 19 and 20 practises architecture;

(c) described himself as an architect in any document;

(d) subject to sections 19 and 20 represents that he is associated with any architect as a partner or is a member of a firm engaged in the practice of architecture. 1972, c.54, s. 42.

Reciprocity

44.(1) Sections 42 and 43 do not apply to:

(a) a person employed in the Armed Forces of Canada, in the service of the Government of Canada or of the Province of Prince Edward Island while acting as an architect in the course of his employment if that person has the qualifications required for admission to the association;

(b) a professional engineer or partnership, association of persons or body corporate entitled under the Engineering Profession Act, R.S.P.E.I. 1974 Cap. E-6 to practise or undertake the practice of engineering or a person employed by and acting under the supervision of such professional engineer, or such partnership, association or body corporate, while practising or applying engineering within the meaning of the said Act;

P.E.I. ...3.

(c) a person in partnership with or employed by a practising architect as a draftsman, student, clerk of works, or inspector while acting under the supervision and direction of a practising member of the association;

(d) a person employed by an architect holding a valid temporary or special license to practise architecture as a draftsman, clerk of works, or inspector while acting under the supervision and direction of an architect;

(e) any person who designs a building the value of which is under one hundred thousand dollars.

Miscellaneous

Where a building is over $100,000.00 the exemption for engineers still applies.

Architects Act S.Q. 1973 c. 59

Quebec

Definitions

Engineers Act S.Q. 1964 c. 262.

2. Works of the kinds hereinafter described constitute the field of practice of an engineer:

(a) railways, aerodromes, bridges or tunnels the cost of which exceeds three thousand dollars, and public roads, excluding government colonization roads and ordinary roads in rural municipalities;

(b) dams, canals, harbours, lighthouses and all works relating to the improvement, control or utilization of waters;

(c) works of an electrical, mechanical, hydraulic, aeronautical, electronic, thermic, nuclear, matallurgical, geological or mining character and those intended for the utilization of the processes of applied chemistry or physics;

(d) waterworks, sewer, filtration, purification and incinerator works the cost of which exceeds one thousand dollars;

(e) the foundations, framework and electrical and mechanical systems of buildings, to the exclusion of non-residential buildings of a total cost not exceeding one hundred thousand dollars and of residential buildings of ten dwellings or less;

(f) structures accessory to engineering works and intended to house them. 12-13 Eliz. II, c. 56, s. 3.

3. The practice of the engineering profession consists in performing for another any of the following acts, when they relate to the works mentioned in the preceding section:

(a) the giving of consultations and opinions;

(b) the making of measurements, of layouts, the preparation of reports, computations, designs, drawings, plans, specifications;

Prohibition

15. Every person, without being entered on the roll, who:

(a) practises the profession of architect;

(b) assumes the title of architect, either alone or with any other word;

(c) uses any title, designation or abbreviation that may lead to the belief that he is allowed to practise the profession of architecture;

(d) acts as an architect or in a manner leading to the belief that he is authorized to act as such;

(e) authenticates by seal, signature or initials any document relating to the practice of the profession of architecture; or

(f) wilfully advertises or designates as an architect a person who is not a member of the Order,

is guilty of an offence and is liable for each offence, to the penalties provided in section 182 of the Professional Code.

16. All plans and specifications for architectural work for the construction, enlargement, recon-

(c) the inspection or supervision of the works. 12-13 Eliz. II, c. 56, s. 4 (part.).

4. For the works described in paragraph e of section 2, an engineer may not do any of the acts contemplated in paragraph b of section 3 without the collaboration of an architect unless they relate to an existing building and do not alter its form. 12-13 Eliz. II, c. 56, s. 4 (part.).

27. Any person not a member in good standing of the Corporation who:

(1) performs any of the acts contemplated in section 3 of this act;

(2) assumes the title of engineer alone or qualified, or makes use of any abbreviation of such title, or of any name, title or designation which might lead to the belief that he is an engineer or a member of the Corporation;

(3) advertises himself as such;

(4) acts in such a manner as to lead to the belief that he is authorized to fulfil the office of or to act as an engineer;

(5) authenticates by means of a seal, signature or initials a document relating to the practice of the engineering profession; or

(6) knowingly advertises or designates as an engineer a person who is not a member of the Corporation,

shall be guilty of an offence and shall be liable for the first offence to a fine of two hundred to three hundred dollars and, in default of payment, to imprisonment for not more than three months, and for each subsequent offence committed within two years after a previous offence, to a fine of four hundred to six hundred dollars and, in default

	struction, renovation or alteration of a building, excluding plans and specifications prepared outside the Province of Quebec, must be signed and sealed by a member of the Order, when the total cost of such work exceeds one hundred thousand dollars or when it relates to a public building within the meaning of the Public Buildings Safety Act (Revised Statutes, 1964, chapter 149.)	of payment, to imprisonment for not more than six months. 12-13 Eliz. II, c. 56 s. 27.
Reciprocity	20. Nothing in sections 15 and 16 shall be interpreted as affecting in any manner the rights conferred by law upon the members of the Order of Engineers of Quebec.	5. Nothing in this act shall: (a) affect the rights of a person entitled to practise as an architect, provided that he has the collaboration of an engineer for the works contemplated by paragraph e of section 2, nor shall it prevent him from collaborating with an engineer who requires his services for the other works contemplated by the said section;

The Architects Act S.S. 1968 c. 6

Saskatchewan

Definition

2(g) "practice of architecture" or "architecture" includes any single act or series of acts in:

(i) the planning, designing, improving or supervision of; or

(ii) the supplying of plans, drawings or specifications for the erection, construction, enlargement, improvement or alteration of;

buildings of any kind or nature or any part or parts thereof, for hire, gain or hope of reward;

The Engineering Profession Act R.S.S. 1965 c. 309

2(f) "professional engineering" or "the practice of professional engineering" means reporting on, advising on, valuing, measuring for, laying out, designing, directing, constructing or inspecting any of the works or processes set forth in schedule A, or such works or processes omitted therefrom as are similar to those set forth therein by reason of their requiring the skilled application of the principles of mathematics, physics, mechanics, aeronautics, hydraulics, electricity, chemistry or geology in their development and attainment; and includes such reporting, advising, valuing, measuring for, laying out, designing, directing, constructing or inspecting by any person under the general supervision of a professional engineer; but does not include the execution or supervision of works as contractor, foreman, superintendent, inspector, road master, superintendent of maintenance, technical assistant, student or engineer in training where the work has been designed by and is done under the responsible supervision of a professional engineer;

SCHEDULE A.
(Section 2, clause (f))

1. Transportation work, roads, railways, waterways, airports, pipe lines and all detail works connected therewith, such as bridges, tunnels, yards, docks, lighthouses, rolling stock, vessels, aeroplanes, airships and pumping stations.

2. Public utility works, such as communication systems, electric power systems, waterworks, gas-works, irrigation works, drainage works, sewerage works, gas transmission and distribution systems and incinerators.

3. Mechanical works, such as steam boilers, engines, turbines, condensers, pumps, internal combustion engines and other motive power machinery and accessories.

4. Works for the capture and utilization of energy derived from nuclear fusion or fission, solar radiation or other sources yielding energy in a state suitable for commercial application.

5. Electrical machinery, apparatus and works for the development, transmission and application of all forms of electrical energy.

6. Mining and metallurgical works such as mining properties, mine and concentrator machinery and apparatus, oil and gas wells, smelters, cyanide plants, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the economical winning or preparation of metals, minerals, rocks or petroleum.

7. The mechanical, electrical, chemical, electro-chemical, mining, metallurgical or heat treatment of any substance, whether organic or inorganic, and combinations thereof for all purposes.

8. Factories, warehouses, swimming pools, rinks, garages, cold storage plants, grain elevators, flour mills, hospitals, schools and public buildings.

9. All buildings and structures necessary for the proper housing, administration or operation of the works mentioned in paragraphs 1 to 8.

10. Investigations relating to the examination, exploration and development of rocks and minerals, mineral deposits, rock structures and oil and gas structures.

11. Engineering works and installations related to town and community development.

12. The exploration, development and employment of water resources for domestic, municipal, industrial, irrigation, water power and other like uses.

Saskatchewan ... 3.

Prohibition

36.(1) Except as may be provided in the bylaws of the association no corporation shall be granted membership in the association or be licensed to practise architecture in the province.

(2) No person or corporation except a registered or licensed architect shall within the province:

(a) take or make use of the name, title of designation of "architect" or any abbreviation, modification, derivative or description thereof, either alone or in connection with any other word, name, title or designation;

(b) practice or offer to practise architecture;

(c) hold himself or itself out as an architect or practising the profession of architecture; or

(d) usurp the functions of an architect.

(3) A person or corporation shall be deemed to be practising the profession of architecture within the meaning of this Act who or which by advertisement, sign or statement of any kind, written or verbal, alleges or implies that he or it is, or holds himself or itself out as being, qualified, able or willing to do any of the acts set out in clause (g) of section 2 or that he or it is an architect.

50. Every person who, not being the holder of a subsisting certificate of registration issued under section 30 or of a subsisting licence issued under section 6, or whose name has, pursuant to subsection (2) of section 10 been removed from the register and has not been reinstated:

(a) engages in professional engineering;

(b) usurps the functions of a professional engineer;

(c) assumes verbally or otherwise the title of professional engineer, or makes use of any abbreviation thereof, or of any name, title or designation that may lead the public to the belief that he is a professional engineer or a member; or

(d) acts in such manner as to lead to the belief that he is authorized to fill the office of or act as a professional engineer;

is guilty of an offence and liable on summary conviction to a fine not exceeding $100 for the first offence and not exceeding $200 for every subsequent offence, or, in the case of a continuing offence, to a fine of not less than $25 nor more than $100 for each day during which the offence continues, and he shall not be entitled to recover any fees, rewards or disbursements for any service rendered by him as a professional engineer or in professional engineering.

Reciprocity

40. Except as provided in section 36, nothing in this Act shall be construed so as to prevent or restrict:

(a) any professional engineer registered under The Engineering Profession Act in the province from practising professional engineering as defined by that Act;

26. Nothing in this Act prevents:

(a) any person from practising his profession, trade or calling, provided that the person shall not style or hold himself out as a professional engineer unless he is registered or licensed under this Act;

Saskatchewan ... 4.

(b) any person from employing, retaining or contracting with any such engineer in the carrying out of any engineering work within the meaning of clause (a);

(c) any person from passing, approving or accepting any plans, drawings or specifications in respect of any engineering work within the meaning of clause (a);

(d) any person who is employed as an architect by a government department whose business is normally carried on in two or more provinces of Canada and who is by reason of his employment required to practise as an architect in other provinces than that of his residence.

(b) any person from practising his profession as an architect under The Architects Act, 1968 or as an agrologist under The Agrologists Act or as a Dominion or Saskatchewan land surveyor or as a planner under The Community Planning Profession Act, but no architect, agrologist, surveyor or planner shall style or hold himself out as a professional engineer unless he is also registered or licensed under this Act.

FOOTNOTES TO CHAPTER IV

1. See for example, California Code, Business and Professional Regulation Division 3 Ch. 3 Art. 5500.3. See also, The Architects Association of New Brunswick Act, S.N.B. 1970, c. 52 as amended which refers to a "design Profession".

2. The Building Code Act, S.O. 1974, c. 74.

3. The Planning Act, R.S.O. 1970, c. 349, s. 35(a).

4. S.O. 1890, c. 44.

5. R.S.O. 1940, c. 53, s. 16; R.S.O. 1927, c. 203, s. 22; S.O. 1931, c. 43, s. 11; S.O. 1935, c. 90, s. 20.

6. The Globe August 1890, p. 5.

7. The Architects Amendment Act, S.O. 1938, c. 47, s. 18.

8. Appendix C of the Research Directorate's Staff Study, "History and Organization of the Architectural Profession in Ontario," 1978, p. 9 and note 11.

9. S.O. 1935, c. 90, s. 9 provided only for temporary licenses for those architects who were British subjects and members of Architecture Associations within the British Empire.

10. Appendix D of the Research Directorate's Staff Study, "History and Organization of the Engineering Profession in Ontario", 1978 .

11. "History and Organizations of the Architectural Profession in Ontario," op. cit.,,

12. The Globe, July 30, 1937, p. 6.

13. S.O. 1935, c. 90, s. 2.

14. R.S.O. 1970, c. 27.

15. Ibid., s. 16.

16. R.S.O. 1970, c. 366.

17. R.S.O. 1970, c. 27, s. 16(4).

18. The Professional Engineers Act, R.S.O. 1970, c. 366, s. 2.

19. [1955] O.W.N. 705, 113 C.C.C. 75 Co. Ct.

20. Ibid., p. 79.

21. (1976), 11 O.R. (2d) 280.

22. Ibid., p. 282.

23. Ibid., p. 286.

24. Ibid., p. 288.

25. 14 O.R. (2d) 399 (D.C.).

26. Ontario Association of Architects, Brief to the Professional Organizations Committee, July 1977, p. 29.

27. Supra note 25, p. 406.

28. 18 C.C.C. (2d) 210; [1955] O.W.N. 705.

29. Ibid., pp. 219-220.

30. Supra, note 26, p. 31.

31. Ibid.

32. See note 29, supra and accompanying text.

33. This chapter will return later to the matter of definitions which a court can use and apply.

34. S.N.B. 1974, c. 18.

35. Ibid., s. 2(1)(e).

36. S.N.B. 1970, c. 52.

37. Ibid., s. 3(b).

38. R.S. Nfld. 1970, c. 258 as amended.

39. Ibid., s. 1(m) and (n).

40. S.B.C. 1960, c. 128.

41. R.S.B.C. 1960, c. 16 as amended S.B.C. 1976, c. 33.

42. Ibid., s. 56. Although it may be thought that this case could be decided solely on the basis that engineers do not usually design theatres, there was evidence that theatres had been designed by engineers. R. v. Bentall 72 C.C.C. 176.

43. See: Architects Act, R.S.N.S. 1967, c. 41 as amended S.N.S. 1975, c. 41 and Architects Act, R.S.P.E.I. 1974, c. A-6.

44. See The Architects Act, S.S. 1968, c. 6 and The Architects Act, R.S.M. 1970, c. A130 and The Engineering Profession Act, R.S.S. 1965, c. 309 and The Engineering Profession Act, R.S.M. 1970, c. E120.

45. Indeed the Ontario Association of Architects makes the points in its brief that the Quebec Acts on these matters do carve out exclusive jurisdiction. See Ontario Association of Architects, Brief to the Professional Organizations Committee, July, 1977, p. 36 . See also Architects Act, S.Q. 1973, c. 59 and Engineers Act, S.Q. 1964, c. 262.

46. [1947] B.R. 378.

47. Ass. des Architectes de la Province de Quebec v. Ruddick (1935), 59 K.B. 72 at 78 referred to at 384 of The Province of Quebec Ass. of Architects v. Pery.

48. See: Engineers Act, S.Q. 1964, c. 262 s. 2(e) and (f).

49. Unpublished Report for the American Institute of Architects 1970 by William J. Geddis, Paul McCurry and Robert McCornell.

50. Ibid., p. XIV.

51. Ibid., p. XV. It should be noted, moreover, that such legislation does not specify what the architects and engineers should be doing but only lists the activities which, if done, represent the practice. What should be done is left to contractual determination.

52. See supra, note 20.

53. Ibid., p. xvii.

54. Supra, note 28.

55. Unreported decision of the Supreme Court of Georgia, January 28, 1977.

56. Unreported decision of the Supreme Court of Alabama, September 28, 1972.

57. Ibid., p. 8 of the unreported judgment.

58. See for example: Verlich v. Florida State Board of Architects 239 50 2d 29 (1970); Sardis v. The Second Judicial Court of the State of Nevada 460 P. 2d 163 (1969); Flateur Fixture and Sales Corp. v. Garcia and Associates, 109 S.E. 2d 818 (1959), D'Luhosch v. Andros, 109 N.Y.S. 2d 491 (1951); Simons, Brittain & English, Inc. v. Armstrong 86 Pa. Supplement 98.

59. 82 A.L.R. 2d 1013 at 1015.

60. A number of cases held that engineers could not practise architecture: Douglas v. Smulski, 131 A 2d 225; Gionti v. Caroun Motor Freight Co., 128 N.J.L. 401, 26 A 2d 282, Smith v. American Packing and Provision Co. 102 Utah 351, 130 P. 2d 951; Heron v. City of Denver 131 Colo. 501, 283 P. 2d 647; State v. Beck 156 Me. 403, 165 A. 2d 433 (160), Lehmann v. Dales 119 Cal. App. 2d 152, 259 P. 2d 727 (1953). All of these cases except for the last one however were essentially concerned with the holding out of an engineer as an architect. Even in the Lehmann decision, however, the Court held that to the extent that architectural and engineering services overlap, they may be rendered by either architects or engineers.

61. 197 N.E. 2d 422 (Ohio 1961).

62. 459 S.W. 169 (1970).

63. Supra note 61 at 427.

64. This approach can also be seen as the one adopted by the Ontario Association of Architects and the Association of Professional Engineers of Ontario in their Joint Statement.

65. Ontario Association of Architects, Brief to the Professional Organizations Committee, July, 1977.

66. The Building Code Act, S.O. 1974, c. 74 and Ontario Regulation 925/75.

67. Ibid., s. 3(2).

68. Report: Interviews with Building Officials, p. 4.

69. Ibid., p. 5.

70. R.S.O. 1970, c. 349 as amended.

71. Ibid., s. 35(a)(2).

72. Ibid., s. 35(a)(2)(11),

73. Ibid., s. 35(a)(2)(12).

74. S. Makuch, "Legal Authority and Land Uses in Central Toronto," 1 M.P.L.R. 241.

75. For example, The Standard Form Development Agreement for the Town of Burlington has such a provision. The Agreement can be found in S. Mukuch,"Cases and Materials on Land Use Controls," Faculty of Law, University of Toronto 1977, p. 302.

76. Interview with Planning Officials, p. 6.

77. Ibid., p. 2 and 8.

78. April 4, 1977, City of Toronto Planning Board.

79. Ibid., p. 3.

80. Ibid., p. 2.

81. Interview with Planning Officials, p. 8.

82. It is recognized that "public interest" is a difficult concept to define. What is meant here is the "public interest" as defined by legislators seeking to control building design and development no matter what their reasons.

83. Submission by Toronto Society of Architects to The Planning Act Review Committee, par. 1.06.

84. One has to question the existence of any objective criteria to determining "good" architecture. This must be a value judgment much dependent on individual taste.

85. Case Studies, p. 30.

86. Ibid., p. 30.

87. Ibid.

88. Ibid., p. 31.

89. Weiler, Two Models of Judicial Decision-Making (1968), 46 C.B.R. 406 at 419.

90. See: Proposed Interim Statement, **prepared** by the Ontario Association of Architects and the Association of Professional Engineers of Ontario, Footnote p. 2.

91. Breger,W., Chairman of the Department of Architectural Design, Pratt Institute, A.I.A. Journal, Feb. 1961, 33.

92. Weiler, supra note 88.

93. Ibid.

94. Ontario Regulation 925/75, supra note 66, s. 2.3.1.

95. Ibid., s. 2.4..

96. Makuch, S., Cases and Materials on Land Use Controls, Faculty of Law, University of Toronto, 1977, p. 302.

97. Interview, Milton F. Lunch, Attorney for National Society of Professional Engineers, August 23, 1977.

98. C.S.C.-TS. 41, August, 1962, Washington, D.C.

99. Chapter III, p. 8.

100. California Code, Businesses and Professional Regulation Div. 3 Ch. 3. Art. 5500.3.

101. This chapter has not focused on the composition of registration bodies. In the United States the practice is to have registration bodies, the members of which are not elected or appointed by the profession. The bodies are, therefore, state appointed but are

101. Cont'd...

invariably made up of representatives of the particular profession (see for example, 249 Texas C.S.A. 2 and 71 Pa. C.S.A. 135). In Great Britain, The Architects Registration Act, 1931 as amended provides for 48 of the 60 members of the Architects Registration Council to be appointed by the profession. There is no similar legislated organization for engineers. In Ontario, the professional bodies are largely elected by the profession. (See The Architects' Act, s. 8 and The Professional Engineers Act, s. 4).

It would seem that the alternatives of professionally appointed or governmentally appointed bodies or a combination of both is not a crucial one. In all cases members of the profession must be on the board because of the need for expertise. Lay appointments in the case of professional or government appointments are possible. The problem of the registration body simply serving the interest of the profession is a severe one no matter which technique is used. Government appointed bodies are very susceptible to this tendency: see: P. Selznick, T.V.A. and the Grassroots, Culture and Society Vol. III, M. Bernstein, Regulating Business by Independent Commission (Princeton Press, 1955) and M. Edelman, The Symbolic Uses of Politics (University of Illinois Press 1967). The real focus of constraining such tendencies must be not by the method of appointment but in ensuring that other concerns besides the profession's narrow interests are taken into account in the decisions that are made.

102. Architects Association of New Brunswick Act, S.N.B. 1970, c. 52 as amended, s. 3(1).

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

A. CONCLUSIONS

The purpose of this report has been to analyze the practice of architecture and engineering in Ontario. The major focus of the report has been on the nature and function of building design, the legal aspects of design, the respective roles of architects and engineers, and the economics of the design process. The role of paraprofessionals has also been considered.

In examining the interface between architectural, engineering and paraprofessional functions in the design process, it was concluded in Chapter II that architecture and engineering have many features in common, although the predominant orientation of each is still recognizable, and will remain so. The traditional client/professional and architect/engineer relationships, upon which professional institutions have been based, are changing. This has led to overlapping of professional functions.

It was found that the dozen or so fields in which engineers practise, including building design, are independent of each other. Within the field of building design, there are a number of specialties, some of

which are practised predominantly by architects, some predominantly by engineers, and some by both. Very few specialties are the exclusive domain of one profession or the other (Chapter II.C.2). Mixed firms, in particular, claim expertise in a large number of specialties. Thus, there is a shared claim of competence by architects and engineers in many areas, which may imply competitive behaviour in some cases and complementary behaviour in others. Chapter II also suggested a changing role for the professions, particularly architecture, as a result of apparent increased public desire to affect design.

Some summary statistics can briefly outline the structure of architecture and engineering firms in Ontario. The average architectural firm employs about 6 persons, the average engineering firm about 12 and the average mixed firm over 50 (Table III.B.12). The average architectural firm employs fewer non-professionals per professional employee than is the case in engineering or mixed firms. It appears that engineering and mixed firms are expanding, while architectural firm size has stabilized.

An examination of the roles of professionals and paraprofessionals in firms of all three types in building design showed that most paraprofessionals are engaged in detailed design, drawings and specifications, and few engage in client consultations and conceptual design (Chapter II.D). It appears that engineering firms are more likely to use

paraprofessionals for client consultation and conceptual design than are architectural firms. However, there was evidence that the roles and responsibilities of para-professionals varied enormously depending upon their capabilities and the firm structure, with some para-professionals holding responsibilities much greater than some professionals.

It is apparent that significant functional substitution between professionals and paraprofessionals is now occurring in Ontario, especially with respect to technical matters. It appears that in some cases paraprofessionals who have developed competence in professional functions may be limited in their career advancement by present institutional arrangements. The opportunity for paraprofessionals to upgrade themselves to professional status, by substituting experience for some educational requirement, is suggested.

In a more detailed examination of the market for professional services Chapter III concluded that no single geographic market definition would always be correct, although in many cases a province-wide market definition seemed appropriate. It was tentatively suggested that the market for professional services in building design was reasonably competitive with a few exceptions. Although oligopoly might occasionally occur, the opportunity for competition between the professions was a major factor in reducing market concentration.

This analysis also found that most clients in the building design field had a high level of expertise in selecting professional consultants. Although a significant minority were uninformed in technical or economic aspects of design it was concluded that most clients rely primarily on market forces in selecting a professional. In particular, they rely on the reputation of a firm, recommendations from other clients or from firms, and the existence of professional liability insurance. There was much less reliance on government regulations and professional organizations.

This chapter indicated as well that there did not appear to be major barriers for those seeking to enter professional business, save the need to acquire the specified education and training, and establish a reputation. It was not possible to determine if current education and training requirements were too rigorous or insufficient; there was not consistent evidence that they were inappropriate. It was found that paraprofessionals were used in many different ways and capacities and that flexibility in their roles was of significant importance.

The fee schedules published by both the OAA and the APEO are apparently used widely, but they are not rigidly adhered to (Chapter III.C.2). Many firms reported that they used the fee schedules as a guide only, not a requirement, and some reported disregarding them completely.

Numerous instances of fees quoted below the scheduled rate were reported. Some clients indicated that they found the fee schedules useful as a means of determining whether they had been billed fairly.

It appears that clients perceive substantial variations in the quality of professional services provided (Chapter III.C.3). Furthermore, a majority do not believe that a high fee ensures a high quality of work. Many clients therefore perform some evaluation of the work done for them to ensure that the services rendered are adequate.

Chapter IV on the legal aspects of design indicated a legal recognition in North America of an overlap between the two professions and suggested nothing to encourage increased regulation of, or restrictions on, the activities of either architects or engineers. It noted that there were few criteria that the courts or administrative bodies could use to determine exclusive areas of jurisdiction for the two professions. The use of a schedule of buildings that each profession could design was not considered appropriate. Moreover, it was noted that a concern for health, safety and aesthetics could be dealt with, from the public's point of view, through the use of planning and safety legislation rather than through exclusive professional jurisdiction.

It was suggested that any changes in legislation regulating the professions might move towards a clearer recognition of the overlap between them. Such a recognition

could be achieved through a broader and overlapping definition of the jurisdiction of each profession which would encompass the building design aspects of the two professions. The example of a broad definition of a design profession was considered, but it was also noted that such a definition should not result in the abolition of separate registration for architects and engineers.

This report in analyzing the nature and function of the design process and the role of architects, engineers and paraprofessionals comes to the conclusion, therefore, that no further government restrictions are desirable in the building design process. Indeed, if action is to be taken it should be to enhance the operation of the market forces presently at work. The overlap between the two professions could be explicitly recognized, and unnecessary jurisdictional barriers reduced. Attention might also be given to facilitating the upward mobility of qualified paraprofessionals to partial or full professional status.

B. APPLICATION OF CONCLUSIONS TO SELECTED POLICY ALTERNATIVES

The preceding section of this chapter has presented a brief summary of the substantive conclusions of our research. Many of these conclusions have been presented in rather narrow

terms related directly to the data that were gathered, and the research methodology that was pursued. The structure of that presentation, however, is not focused upon the policy alternatives that the Province of Ontario may wish to consider in the near future. In this section, some specific policy alternatives that might be considered with respect to the regulation of the architectural and engineering professions are identified and evaluated. No particular policy is recommended. Rather, it is attempted to show how the research results may be applied to the evaluation of alternative policies. The actual selection of a policy would in most cases involve not only the consideration of issues discussed in this report, but also other issues that are beyond the terms of reference. Thus, even where this analysis shows some benefits for a particular policy and no corresponding disbenefits, such a policy should not necessarily be adopted, since considerations outside the terms of reference might counter-balance whatever benefits were found here. This section should therefore be regarded as another means of summarizing the findings, not as a set of policy recommendations.

1. Specialty Designation for Engineers

One alternative is for engineers, whether involved in building or non-building activities, to designate the specialty fields in which they are qualified to practise. The APEO currently has a voluntary program under which

an engineer may apply to a special committee of the APEO for specialty designation. The experience and training of the applicant is considered in determining whether he is entitled to the specialty designation or not. The APEO regards its current voluntary program as a "moderate success".

The major problem with the existing program is the difficulty in establishing fair and uniform criteria with which to judge whether someone is entitled to be designated as a specialist in an area. This is of some importance under a voluntary program such as that currently in use. It would become vitally important, however, if the program were mandatory in that no one could practise any specialty without being designated as a specialist. In this case, the prohibition against practice would make it essential to the career of the practitioner that he be carefully judged with respect to his specialty designation.

The present program may be regarded as serving an informational function, since identification of a specialty by the APEO gives some assurance to a would-be client that the practitioner has achieved a given level of competence in that specialty, although the specific level of competence is somewhat unclear. Presumably, the purpose of a mandatory registration would be to prohibit practice in particular specialties by those who were not certified to be competent in that specialty. On the face of it, this would seem to be desirable. There are,however, several problems.

Section III.B.1 of this report showed that over a dozen fields of engineering practice are relatively independent, in that most firms (and thus individuals) tend to do the bulk of their work in only one of these fields (see for example Table III.B.1). With this high degree of specialization by aggregate fields, it seems most unlikely that a client could be confused about the type of work for which the firm or individual was best known. A prohibition against practising in some other fields would seem to be of little benefit, if the fields were this broadly defined.

It was also shown in Chapter III.B.1 that among the specialties within the building design field, most firms regarded themselves as experts in several such specialties (see for example Table III.B.2). While this study does not have information in individuals, it seems reasonable to suppose that any individual within a firm would be significantly more specialized than the firm itself.

The high degree of existing specialization suggests that both the benefits and the costs of a required specialty designation may be small. Since most individuals are engaged in the practice of only a small number of specialties, they would be little restricted in the short run by a requirement that they qualify for registration in the specialties. On the other hand, with a high degree of specialization, it seems likely that most clients can easily learn the areas in which a firm has established its reputation and expertise. In fact,

in Chapter III.C.1, it was clearly demonstrated that firms distinguish themselves by establishing a reputation in a particular field of work. The difficulty of setting fair and effective criteria to ensure continuing competence in a specialty, and the reliance by clients upon market forces rather than professional bodies for quality control suggest that the protection offered to the public by mandatory specialty designation would be minimal.

An important issue raised by required specialty designation however, is flexibility over time. The role and function of an engineer changes significantly over the course of his lifetime career. Not only is there a general progression from technical to administrative work, but there is often a significant change in the type of technical work that is done. A rigid system of specialty designations would tend to inhibit the flexible movement of personnel from one specialty or problem area to another in response to changing demand in those areas and the changing interest of the professional. It is clear that in engineering, as in other professions, there can be substantial learning by doing, so that an individual may develop over several years of real expertise in a specialty in which he was originally not an expert. A specialty designation that limited this kind of migration would impose costs in the form of unnecessary rigidity. It is difficult to see how a specialty designation requirement could both protect clients against inexperienced

practitioners and allow practitioners to gather experience in new areas.

In short, there seems to be little problem under the present system with clients discovering the type of work that is done by individuals in firms, and the type of work in which they are competent. Imposing a specialty registration requirement would necessarily introduce some rigidity into the present system, in exchange for benefits which do not appear to be large. These arguments would suggest that a required specialty designation might impose costs greater than the benefits it would generate.

One other issue, that is not specifically considered in this report, would be relevant to evaluating this policy. If practitioners held themselves out as specialists in an area, would the standard of care to which they would be held in suits for negligence be that of the general practitioner, or that of the specialist? If the latter, then introducing the specialty designation would necessarily require a higher level of practice from anyone who engaged in that specialty than is currently required. This means that the insurance system for professionals might have to be adjusted if a specialty designation system were instituted.

An important finding of this report has been the close relationship between the kinds of work done by architects and engineers, and the difficulty of separating work in the building design field into distinct compartments.

A specialty designation system would be inconsistent with this overlapping workload that has been observed.

2. Consideration of the Role of Professionals in Building Design

a) Status quo

This report has found that the present system yields a reasonable amount of competition in most areas of practice. Most clients find a sufficient number of firms within a reasonable geographical radius capable of satisfying their needs that high levels of market concentration could not be regarded as a general problem (see Chapter III.B.2). Barriers to entry into the practice of architecture and engineering do not appear unreasonably high (Chapter III.B.5). The search by clients for professionals to provide a given service seems to be a reasonably open and competitive one (Chapter III.C.1) and the pricing of services maintains at least some elements of competition (Chapter III.C.2). It appears that clients rely primarily upon market-oriented processes to guarantee the quality of the work that they receive (Chapter III.C.3) and there is not a high level of client dissatisfaction with this work (Chapter II.C.1, Chapter II.C.3). Building codes, planning legislation and other regulations provide some added protection for clients and for third parties (Chapter IV). Finally, the scheme of regulation applied in Ontario is found elsewhere in Canada, and is reflective of the general trend of legislation in the United States (Chapter IV.A and IV.E).

From these points of view, it would appear that continuation of the status quo is an acceptable policy according to the factors examined in this study.

b) Narrowing and delineating the jurisdiction of architects and engineers

One modification of the status quo would be to try to specify exclusive jurisdiction for engineers and architects in areas where they now enjoy simultaneous jurisdiction. This might be done by specifying types of buildings that could be designed only by architects and others that could be designed only by engineers, by reserving the role of prime consultant to one profession alone, or by prohibiting members of one profession from practising in firms involved with the other profession. Currently Manitoba, Saskatchewan and Quebec specify in varying degrees of detail the buildings that may be designed by architects and by engineers (Chapter IV.D).

Chapter II.C and Chapter III.B.1 showed the substantial overlap in the areas of specialization where architects and engineers claim expertise. Chapter II.B and C showed that there is a large overlap in the specialties currently practised by architects and engineers. Chapter IV showed a legal recognition of that overlap and the legal difficulty of segregating the roles of architects and engineers. Moreover, increasing project size and complexity appear to require more and not less interaction between

architects and engineers. There was no evidence from architectural and engineering firms and from clients that clients frequently hire a member of one profession when in fact they desired a member of the other. The vast majority of the clients of these firms are reasonably sophisticated and well informed, and should therefore be able to judge for themselves which professional they would like to have responsible for a particular project (Chapter III.B.3).

From the above, it is concluded that further restricting the scope of practice of architects or engineers would yield little public benefit and might raise substantial costs by making the practice of each profession less efficient and restricting the range of choices available to clients.

c) Prohibit publication of fee schedules

Currently both the APEO and the OAA publish schedules showing the suggested fees for the performance of various kinds of work. It might be suggested that the mere publication of these schedules would tend to raise the average price charged for professional work, operating as a form of price fixing. If this were the case, it might be suggested that the publication of these schedules be prohibited, so that all prices could be set in a competitive manner.

Chapter III.C.2 found that the effect of the published fee schedules on actual fees charged is not powerful. There appear to be some cases of fee cutting by both

architectural and engineering firms where market conditions warrant. Under the current Combines Investigation Act, it is unlikely that the professional bodies could legally enforce adherence to the fee schedules. Many of the tasks performed by professionals, at least in the building design field, are sufficiently complex that it is difficult to apply a fee schedule rigorously to them. All of these factors suggest that the actual effects of the fee schedules in maintaining fees above competitive levels is relatively modest.

In addition, there is some evidence that some clients find the fee schedules a useful reference to determine whether they have been charged a fair price for a job or not. In some cases, the fee schedule may actually prevent a firm from overcharging by providing a reference to which the uninformed client can turn.

From the above, it is concluded that the economic benefits from prohibiting the publication of fee schedules would be small. The possible economic costs from denying information to uninformed clients may or may not be small. There does not seem to be a strong argument for or against such a policy.

d) Replace licensure of architects and engineers with certification

This proposal is presented as a counterpoint to other proposals. It would imply that anyone could engage in

the practice of architecture or engineering, but only certified architects and engineers could use the title Professional Engineer or Architect. The benefits would presumably be an increase in the diversity of practice in building design and perhaps some resulting reduction in costs for some types of work. The costs would include the risk of work of unsatisfactory quality being performed by non-certified practitioners.

Chapter III.B.3 found that most clients of both architectural and engineering firms are reasonably well informed about the economic and technical aspects of the practice of these professions. These informed clients choose their professionals on the basis of past experience with that professional or the reputation of the professional in the particular area and specialty. It seems most unlikely that sophisticated employers and clients would be affected by replacing licensure with certification. For those who make their decisions on the basis of past work, the title is probably irrelevant.

The real problem is the effect of this change on uninformed or unsophisticated clients. It is possible that clients who cannot themselves evaluate the competence of practitioners would also select a certified practitioner, to protect themselves against unknown quality, and therefore receive the same protection that they are currently afforded. Alternatively, unsophisticated clients may fail to understand the significance of certification, or may be completely

unaware of it, and might inadvertently hire uncertified practitioners who might perform unsatisfactory work. It is not possible to determine from this study how the uninformed clients would behave in this situation, and whether significant social costs would result.

It has been argued in this report that the quality of work may be maintained by regulation of the professional, or by regulation of the product by building codes, planning legislation, and other such legislation. If one were concerned about protecting certain client groups from substandard design work, it would be essential to consider the mix of professional regulation and product regulation that would give the desired protection at the least cost. Furthermore, a compulsory insurance system can protect clients by ensuring full compensation of the client for any losses suffered from inadequate design.

In view of this, it is not possible to give a conclusive evaluation of this proposal. While it is possible that the proposal would yield lower costs, and have no effect on the quality of work performed, one would need to look more carefully at the behaviour of the less sophisticated client and the efficacy of product regulations and insurance practices to be sure that the public was adequately protected.

Chapter IV.C showed that other jurisdictions have not moved in this direction. Thus, there is little precedent in Canada or the United States upon which to base an

evaluation of the performance of such a system.

e) <u>Building design profession</u>

Although it has not been done elsewhere in North America, it has been suggested that because of the large overlap between the functions of architects and engineers in the design of buildings, it would make sense to create a new and separate Building Design Profession in Ontario that would encompass the functions of both architects and engineers in building design. The object of such a profession would be to eliminate the artificial barriers between the types of work done by the two professional groups today, and allow individuals of either profession to become expert in any range of building design activities. There are many alternative methods for creating and specifying such a Building Design Profession. We will consider here one in which architects and engineers continue to retain exactly their present powers and jurisdictions. In addition to the two existing professional organizations, a third organization would be created, a Building Designers Association, whose members would be entitled to practise elements of building design currently open either to architects or engineers.

A primary difficulty with the proposal for creating a Building Design Profession is the specification of qualifications to enter that profession. Both the APEO

and the OAA have spent years in developing criteria for membership in their organizations, including both particular work experience and particular schooling. If the new Building Design Profession were to be analogous to the existing engineering and architectural profession, then a similar set of educational requirements, apprenticeship requirements, and examination requirements would have to be established, and a body created to oversee the application of those standards. One might take a combination of some engineering requirements and some architectural requirements to form the new professional requirements. However, both the architectural and the engineering professional associations rely heavily upon the universities for specifying and providing courses of study tailored to the professional bodies. Since there is currently no course of study that would necessarily be appropriate for a Building Design Profession, a large amount of work might be necessary to specify the particular courses or fields of study that would go into such a requirement.

Alternatively, one might become a member of the Building Design Profession by successfully practising building design as an architect or an engineer for a period of time, and then applying for admission to the broader Building Design Profession. Presumably, the new profession would in no way restrict the rights of existing or future architects or engineers. If such were the case, there would appear to be

little need for such a designation, unless the current definition of the practice of architecture and engineering were unduly limited.

It seems likely that a new professional body of the type suggested above could provide the same kind of public protection that is provided by the OAA and the APEO currently. While building design may cover both architectural and engineering activities, it probably would not be as broad a classification as "engineering" which encompasses many diverse fields in addition to building design, and yet is currently under the control of a single professional body. Problems would then arise in defining the jurisdictional boundary between engineers and the design profession.

Since Chapter III.C.3 concluded that the primary control over the quality of professional practice was by essentially market forces, these forces should operate just as well on a design profession as they do on the architectural and engineering professions. Thus, the overall level of client protection is likely to be maintained.

It is not expected that the creation of a Building Design Profession would lead to individuals designing large buildings single-handedly. The problem with the current legislation is not that a single individual is prohibited from designing an entire building, but first that some firms may be restricted from handling all aspects of building design, although they could attract personnel competetent

to do the job, and secondly, that some professionals may be prohibited from performing some functions at which they are entirely competent because those functions are similar to those that have regularly been practised by the other profession. It would appear that these limitations could be overcome in part by the creation of a design profession, although broadening the legal definition of architecture and engineering could also overcome some such problems. Such broadening would not, however, solve the problem of other technical groups such as landscape architects and accountants who currently have a role in building design that might be expanded by a building design profession, but not by relaxing the Architects Act or the Engineers Act.

The above discussion suggests that some, but not all, of the benefits of creating a Building Design Profession could be achieved by relaxing the restrictions of the acts that currently regulate the practice of architecture and engineering. The magnitude of the benefit depends on the extent to which such a profession would allow a more efficient allocation of functions among architects and engineers, and the extent to which more diverse, creative and efficient building design practices might emerge. The costs do not seem large if the profession is licensed, other than the administrative costs for a new professional body. If the Building Design Profession operated by certification rather than licensure, then the comments above on certification

for architects and for engineers would apply.

f) Product regulation

An alternative to protecting the public through the regulatory activities of the professional organizations would be strengthening the protection afforded by building codes, planning legislation, and other similar laws and regulations.

It has been shown that product regulation is to some extent a substitute for professional regulation in protecting unsophisticated clients from low quality work. Since "buildings" include a very hetergenerous mix of sizes and types, and since clients are a very diverse group, it is unlikely that the best protection would be afforded by relying exclusively on professional regulation or on product quality regulation. It is probable that the most efficient protection (protection of vulnerable clients without imposing excessive costs on other clients) would be afforded by some mix of policy instruments.

It was shown in Chapter IV that the protection afforded by the building codes and planning legislation varies enormously from one jurisdiction to another. Some municipalities apply their regulations with great vigour, while others seem to apply them little or not at all. Publicized events in Toronto last year regarding plumbing installation and the conversion of family housing to

bachelor-type accommodations suggest that it is at least possible for product quality regulation to be ineffective. Of course, the failure of regulatory mechanisms for various reasons is not limited to product quality regulation.

It seems plausible to assume that more stringent regulations and more enthusiastic enforcement could increase the level of protection afforded by these product regulations. The evidence in this study, however, is not sufficient to compare the degree of protection afforded by the professional organizations and by product regulation. There is simply no quantitative basis for estimating either the current impact of each, or the change in impact of either, resulting from a particular policy. Thus, while it appears that product regulation could provide some additional protection beyond what is currently afforded, and this could substitute for regulation by professional bodies, it is difficult to be more specific than this.

3. Allow Paraprofessionals to Provide Services Directly to the Public in Specific Situations

It has been proposed that paraprofessionals who are not members of the OAA or the APEO be allowed to engage in building design activities without the supervision of a professional, in the design of buildings of a limited size, such as under 10,000 square feet. This provision would in a sense give the paraprofessional a right to practise

equivalent to that of an architect or engineer within this limited building size definition. The benefits of the proposal would presumably be a reduction in the cost of some types of work.

Several factors bear upon the consequences of this proposal. Chapter III.B.3 found that the majority of the clients of architectural and engineering firms were well informed and sophisticated about the work done for them. In section III.C.1, it was seen that the reputation of the professional firm in a variety of aspects was an important element in the selection of the professional. These two facts suggest that the well informed client would go to a paraprofessional for buildings within the allowed size range only if they were confident that the work would be of a satisfactory quality. In short, it seems unlikely that the effective protection of informed clients would be reduced by this proposal.

However, Chapter III.B.3 also determined that there are some clients who are not well informed about the technical and economic aspects of the work performed for them. While uninformed clients may also select professional firms by their reputation, their search process is considerably less elaborate than that of the sophisticated client. It is also possible that the search process would be particularly truncated for small jobs which would include small buildings.

The uninformed client might choose to retain only registered architects and engineers, in order to avoid having to evaluate the competence of the paraprofessionals; they might intentionally choose paraprofessionals on some grounds; or might simply be confused about the distinction between them. The evidence gathered in this study is not sufficient to indicate how the uninformed client would behave in the face of this policy. If there was a significant difference in the quality of the work performed by professionals and by paraprofessionals for buildings of this size, it would be important to evaluate the behaviour of uninformed clients before making such a change.

The ability of product regulations, such as building codes and planning legislation, to ensure that minimum quality standards were maintained, should be considered. It is possible that relaxed professional controls and increased product regulation would give good quality control at a lower cost than the present mix of policies. If the quality of the work was essentially identical, then such an investigation would be unnecessary. Presumably, small buildings were chosen for this provision because the complexity of the design is minimized, and the possible problems that could arise as a result of not having a fully qualified professional on the job would be minimal.

Chapter II.D demonstrated that paraprofessionals perform a variety of functions in architectural and

engineering firms, although they do little conceptual design and client consultation. Thus, it is entirely plausible that at least some paraprofessionals would be fully competent to perform the design work for buildings of a limited size without professional supervision. This study does not determine the exact competence of paraprofessionals, or the proportion that would be in this position, but it does suggest that some of them are quite competent.

From this analysis, one might conclude that allowing paraprofessionals to practise in this limited area might lower the cost of providing these services, to the extent that paraprofessionals would charge lower fees than professionals. This would in turn somewhat reduce the business of architects and engineers. It seems unlikely that the change would affect the quality of work received by well informed clients, but the effect on the quality of work performed for the unsophisticated client is unclear. Some further consideration of the quality of work likely to be performed by paraprofessionals in this area would be useful, along with an effort to determine whether clients would adequately distinguish between the work of professionals and paraprofessionals if there are real differences.

One issue that arises in allowing paraprofessionals to practise directly before the public with professional supervision, is what relationship should exist between the

professional and paraprofessional associations. In specific, should the paraprofessional association be a part of or subordinate to a professional organization?

While this study is not sufficiently broad to permit an answer to that question, it does suggest one factor to be considered. One possible motivation for such a change would be to improve the competitive environment in the design of small buildings, and perhaps reduce the cost of such design by substituting less expensive paraprofessional skills for professional skills. To the extent that there is direct competition between these groups, that competition will operate more freely if the paraprofessional association is independent of the professional association. If they are not independent, it is at least possible that the professional association will attempt to ensure that such competition as does emerge will not harm the professional, and this may in turn be detrimental to the economic interests of the public. While the professional organizations may prefer to work with rather than compete with paraprofessionals, it is not clear that this will result in the lowest price to the public for a given quality of work.

A P P E N D I C E S

APPENDIX A

FIRM QUESTIONNAIRE

APPENDIX A

Ontario

PROFESSIONAL ORGANIZATIONS COMMITTEE
MINISTRY OF THE ATTORNEY GENERAL

SURVEY OF ARCHITECTURE AND ENGINEERING FIRMS IN THE PROVINCE OF ONTARIO

INSTRUCTIONS FOR COMPLETING THE QUESTIONNAIRE:

1. It is important that each question be answered unless otherwise specified in the instructions to the question. Some of the information requested may not be immediately available to you. Where your firm cannot obtain this information from records or directly from personnel, please provide your best estimate.

2. The questionnaire seeks information primarily about your firm's Ontario operations. Where possible, answer the questions about the activity of offices in Ontario only. If the firm's Ontario office(s) work(s) extensively with clients outside the province, include only that portion of the work performed by individuals resident in Ontario.

3. The questionnaire was designed to be completed by the firm's principal or head office in Ontario. If the questionnaire has been received in error by a branch office or business location responsible to a head office elsewhere in Ontario, please do **not** respond. A duplicate questionnaire has been sent to the head office.

4. For the purposes of this questionnaire, we request that you use the following classifications for employees of the firm:

SENIOR ARCHITECT OR ENGINEER	An individual who has been licensed/registered for more than five (5) years.
JUNIOR ARCHITECT OR ENGINEER	An individual who has been licensed/registered for five (5) years or less.
PROBATIONARY ARCHITECT OR ENGINEER	A full-time employee who has completed the university training required for a professional designation and is within the professional organization's period of internship.
NON-REGISTERED ARCHITECT OR ENGINEER	An individual who has completed the university training required for a professional designation but who is not in a professional organization's internship program.
PARA-PROFESSIONAL	An individual who does technical work but is **not** included in one of the above categories.

INSTRUCTIONS FOR RETURNING THE QUESTIONNAIRE:

Upon completing the questionnaire, insert it in the white Business Reply Envelope and post. Do not enclose the coloured business reply card with the questionnaire. MAIL IT SEPARATELY.

This procedure preserves the anonymity of your response while at the same time indicating that you have returned your questionnaire. In this way, reminders will be directed only to those who have not replied.

SECTION I GENERAL INFORMATION

I.1 Please give the first letter only of the postal code for your firm's principal or head office in Ontario. ☐

I.2 What is the population of the **municipality** in which this office is located? (check one)

(i)	Less than 5,000	☐
(ii)	5,000 to 30,000	☐
(iii)	30,001 to 100,000	☐
(iv)	100,001 to 500,000	☐
(v)	500,001 or more	☐

I.3 (a) Did your firm have more than one **full-time** office location on January 1, 1977? yes no

(b) if yes — indicate with a check the relevant number of offices in each location

		Less than 3	3 or more
(i)	in Ontario		
(ii)	outside Ontario		

1.4 (a) Which of the following categories applies to your firm: Check one.

(i)	sole proprietorship	
(ii)	partnership	
(iii)	incorporated company	
(iv)	other (please specify) ______________________	

(b) If your firm is a partnership. Please indicate the number of partners in the firm on January 1, 1977:

partners

(c) If your firm is an incorporated company, please indicate the percentage of the company owned by:

		%
(i)	architects resident in Ontario	________
(ii)	engineers resident in Ontario	________
(iii)	architects not resident in Ontario	________
(iv)	engineers not resident in Ontario	________
(v)	Others resident in Ontario *	________
(iv)	Others not resident in Ontario **	________

* Including other firms whether or not authorized to practise engineering with head office in Ontario.

** Including other firms whether or not authorized to practise engineering with head office outside Ontario.

SECTION II MANPOWER

Question II.1 asks for information on firm size for the period 1973-1977. If your firm was established after 1973, enter zero's in the table for previous years.

II.1 (a) Please enter the number of individuals in the firm (using the definitions given in the instructions to this questionnaire). Use the beginning of the year as a point of reference. Do not list any individuals in more than one category: Include owners and partners in the appropriate categories.

	1972	1973	1974	1975	1976
(1) senior and junior architects					
(2) senior and junior engineers					
(3) non-registered architects					
(4) non-registered engineers					
(5) probationary architects					
(6) probationary engineers					
(7) para-professionals					
(8) others					
Total					

		1973	1977
(b)	(1) senior architects in the firm in:	______	______
	(2) senior engineers in the firm in:	______	______
	(3) junior architects in the firm in:	______	______
	(4) junior engineers in the firm in:	______	______

(c) Of the individuals who were with your firm on January 1, 1973, how many:

	Left Before Jan. 1, 1975	Left After Jan. 1, 1975	Are Still With Your Firm
a) senior architects			
b) senior engineers			
c) junior architects			
d) junior engineers			
e) probationary architects			
f) probationary engineers			
g) para-professionals			

II.2 This question is concerned with the background and qualifications of the men and women in your firm, including owners and partners, but excluding clerical and secretarial staff. Complete the table by inserting appropriate designations (e.g. civil engineer, electrical engineers, architect, building technologist, engineering technologist, etc.) and entering the number of individuals holding that designation in the appropriate cell. Use January 1, 1977 as a reference date.

Note: An individual can hold more than one designation and appear in more than one row. If there are no individuals in a particular category, mark a zero in that category. Do not leave any categories blank.

ENTER APPROPRIATE DESIGNATIONS BELOW	Senior Architects or Engineers	Junior Architects or Engineers	Non-registered Architects or Engineers	Probationary Architects or Engineers	Para-Professionals

SECTION III PROFESSIONAL SERVICES – GENERAL

III.1 Consider all the clients served by your firm in the last 3 years, January 1, 1974 – January 1, 1977. Approximately what percentage were located in: (For corporate clients, use the head office location in Ontario).

(i)	Your own Town or Municipality (if other than Metro Toronto)	______
(ii)	Metro Toronto	______
(iii)	Rest of Ontario	______
(iv)	Canada (outside Ontario)	______
(v)	U.S.A.	______
(vi)	International	______
		100%

III.2 Approximately what percentage were:

(i)	Industrial and Commercial Companies	______
(ii)	Real Estate Development Companies	______
(iii)	Non-Profit Institutions	______
(iv)	Government (All Levels)	______
(v)	Individuals	______
(vi)	Architecture and/or Engineering Firms	______
(vii)	Other (Please specify **if more than 10%**) ______________________	______
	______________________________________	100%

III.3 Has your firm provided services to clients in any of the fields below in the last 3 years? Please state the approximate percentage of your firm's **gross billings** derived from each field.

(i)	agriculture, fisheries, forestry, forest products	______
(ii)	air and sea ports, harbours and terminals, coastal works	______
(iii)	bridges, tunnels, highways and railways	______
(iv)	buildings	______
(v)	dams, irrigation and flood control	______
(vi)	plant process design	______
(vii)	mining and metallurgy	______
(viii)	municipal services (incl. sanitary engineering)	______
(ix)	petroleum and natural gas	______
(x)	power generation, transmission and distribution	______
(xi)	telecommunications	______
(xii)	urban and regional planning	______
(xiii)	other (please specify **if more than 10%**) ______________________	______
	______________________________________	100%

SECTION IV PROFESSIONAL SERVICES – BUILDING DESIGN

This section seeks more detailed information from firms providing professional services to clients in the area of building design. **Only those firms that indicated in Question III.3 that they provided services in the area of buildings are required to answer the questions in this section.**

IV.1 Please indicate the approximate **TOTAL COST OF CONSTRUCTION** of projects in each category in which your firm was **PRIME CONSULTANT.** Consider only projects completed in the last 3 years (January 1, 1974 - January 1, 1977)

Client Type / Building type	Industrial & Commercial Companies	Real Estate Development Companies	Non-Profit Institutions	Government (All Levels)	Individuals	Architecture and/or Engineering Firms	Other (if More than 10% of Projects
1) Single Family Residential							
2) Low Rise Multiple Residential (e.g. Row Housing)							
3) Other Residential							
4) Institutional							
5) Office Commercial							
6) Retail Commercial							
7) Industrial							
8) Other							

IV.2 Please indicate the degree of expertise that your firm has in each of the activities listed below. Give your response by circling a number from 1 = considerable expertise to 4 = no expertise.

		Considerable Expertise			No Expertise
A.	1. Design of Structural Systems	1	2	3	4
	2. Design of heating, ventilation, air conditioning systems	1	2	3	4
	3. Design of Plumbing Systems	1	2	3	4
	4. Design of Electrical Systems (Incl. communications & Illumination)	1	2	3	4
	5. Design of Enclosures (e.g. roofs, walls)	1	2	3	4
	6. Design of People Movement Systems	1	2	3	4
	7. Design of Acoustical Systems	1	2	3	4
B.	1. Design of External Appearance	1	2	3	4
	2. Design of Interiors	1	2	3	4
	3. Furniture and Furnishings	1	2	3	4
	4. Design of Landscapes	1	2	3	4
C.	1. Building space layout	1	2	3	4
	2. Site planning	1	2	3	4
D.	1. Project Management	1	2	3	4
	2. Construction Management	1	2	3	4

IV.3 Please check each category below in which your firm has performed services within the last 3 years. Put the check in each building size column in which the services were provided.

		Buildings under 6000 sq. ft.	Buildings 6000 - 15000 sq. ft.	Buildings over 15000 sq. ft.
A.	1. Design of Structural Systems			
	2. Design of Heating, Ventilation, Air Conditioning Systems			
	3. Design of Plumbing Systems			
	4. Design of Electrical Systems (incl. Communications & Illumination)			
	5. Design of Enclosures (e.g. roofs, walls)			
	6. Design of People Movement Systems			
	7. Design of Acoustical Systems			
B.	1. Design of External Appearance			
	2. Design of Interiors			
	3. Design of Furniture & Furnishings			
	4. Design of Landscapes			
C.	1. Building space layout			
	2. Site planning			
D.	1. Project Management			
	2. Construction Management			

IV.4 This question seeks information on the types of individuals working in areas of **Building Design** within your firm. Complete the table below by entering letters in the cells corresponding to the following code:

Work Done By:

A	=	Engineer
B	=	Architect
C	=	Supervised engineering para-professional
D	=	Unsupervised engineering para-professional
E	=	Supervised architectural para-professional
F	=	Unsupervised architectural para-professional
G	=	Other

If the work is done by more than one category, enter the code letters of all categories doing the work.

For Example:

Site Planning	B	B	BDE	E	E	B

	Client Consultation	Conceptual Design	Detailed Design	Drawings	Specifications	Supervision
1. Impact and Feasibility Studies						
2. Architectural						
3. Structural						
4. Heating, Ventilation & Air Conditioning						
5. Plumbing						
6. Mechanical Other Than 4 & 5						
7. Communication						
8. Illumination						
9. Electrical other than 7 & 8						
10. Acoustics						
11. People Movement Systems						
12. Site Planning						
13. Landscape						
14. Furniture & Furnishings						
15. Other (please specify) ______						

SECTION V BILLINGS AND PROFESSIONAL FEES

V.1 For the 3 year period (January 1, 1974 - January 1, 1977), please state the number of completed professional assignments in each of the fee categories listed below:

	Gross Fees	Net Fees (Gross fee minus Sub-consultants Fee)
(i) under $1,000	______	______
(ii) $1,000 to $5,000	______	______
(iii) $5,001 to $10,000	______	______
(iv) $10,001 to $25,000	______	______
(v) $25,001 to $50,000	______	______
(vi) $50,001 to $100,000	______	______
(vii) $100,001 to $500,000	______	______
(viii) $500,001 to $1,000,000	______	______
(ix) $1,000,001 or over	______	______

V.2 What methods does your firm use for calculating the price of professional assignments? Please indicate the percentage of professional assignments priced according to each method listed below:

(i) Time (per diem and payroll costs - adjusted for overhead)	______
(ii) Percentage of cost of construction	______
(iii) Time plus percentage of cost of construction	______
(iv) Fixed fee	______
(v) Value of service to client	______
(vi) Other (please specify) ________________	______
__________________________	100%

SECTION VI COLLECTIVE BARGAINING

VI.1 What percentage of your firm's employees engage in formal collective bargaining under Ontario's Labour Relations Act?

________ % of employees

VI.2 For those that engage in formal collective bargaining, how would you describe their bargaining units: (please check the appropriate category(ies)).

(a) Separate bargaining unit of professionals, excluding para-professionals ☐

(b) Separate bargaining unit of professionals, including para-professionals ☐

(c) Involved in the bargaining unit of other employees (if checked, please specify) ________________________ ☐

(d) Other (if checked, please specify) ____________________ ☐

VI.3 To what extent do your firm's professional employees engage in any kind of **collective** bargaining, formal or informal? (e.g. consultation with employee representative(s))

____

____

____

V.4 Briefly describe the process by which salaries and working conditions are determined in your firm.

____

____

____

THANK YOU FOR YOUR CO-OPERATION!

APPENDIX B

CLIENT SURVEY

APPENDIX B

Architecture & Engineering - Client Survey
Classification of Clients

	Proposed sources for sampling frame	- sample size
1. government (all levels)		
(i) institutional	CEO directory	15/2
(ii) low-rise multiple residential	OHC/CMHC	0/1
(iii) high-rise & other residential		0/1
2. non-profit institutions		
(i) institutional	CEO Directory	5/1
(ii) residential	personal contacts	
3. individuals	Metro Borough	0/2
(i) single-family residential	Bldg. Permits	
4. real estate development companies		
(i) office commercial	U.D.I.	
(ii) retail commercial	CIPREC	10/1
(iii) industrial	/Southam Press/	
(iv) single-family residential	Tor.Home Bldrs.Assoc.	
(v) low-rise multiple residential		
(vi) high-rise & other residential		10/1
(vii) multi-use bldgs.		
5. industrial & commercial companies		
(i) retail commercial	CEO directory	10/1
(ii) office commercial	commercial sources	10/1
(iii) industrial	[Dunn & Bradstreet]	10/1
(iv) multi-use bldgs.		
6. Highway and roads	MTC	0/1
	TTC	0/1

Total Interviews	Telephone	/Interviews
	70	14

Architecture & engineering - client survey
draft questionnaire

For Office Use Only

Record of Calls			
Day	Date	Time	Results
1			
2			
3			
4			

1. interview: 1. completed
   2. incomplete
   3. not applicable
   4. refusal
   5. non-response

2. Date: ____________________

time finished: ____________
time started: ____________
length ____________

3. name of respondent: ______________________________

4. name of organization: ______________________________

5. address of organization: ______________________________

6. client classification:
   10. provincial gov't - institutional
   11. - low-rise multiple residential
   12. - high-rise & other residential
   13. municipal & regional gov't - institutional
   14. - low-rise multiple residential
   15. - high-rise & other residential
   16. federal gov't - institutional
   17. - low-rise multiple residential
   18. - high-rise & other residential
   20. non-profit organizations - institutional
   21. - residential
   30. individuals - single-family residential
   40. real estate dev't co. - office commercial
   41. - retail commercial
   42. - industrial
   43. - single-family residential
   44. - low-rise multiple residential
   45. - high-rise & other residential
   46. - multi-use bldgs.
   50. commercial co. - retail commercial
   51. - office commercial
   52. - multi-use bldgs.
   53. industrial co. - industrial
   54. - office commercial
   60. hwy & rds - MTC
   61. - TTC

1/6

Professional Organizations Committee
Ministry of the Attorney General

DO NOT WRITE IN THIS SPACE

Questionnaire for clients of firms offering building design services.
- CONFIDENTIAL -

FOR THE PURPOSES OF THIS SURVEY, WE ARE ONLY INTERESTED IN RESPONSES FROM FIRMS THAT HAVE BEEN INVOLVED IN OR COMMISSIONED NEW BUILDING CONSTRUCTION OR SUBSTANTIAL RENOVATIONS IN THE PROVINCE OF ONTARIO, USING AN ONTARIO BASED FIRM OFFERING BUILDING DESIGN SERVICES, IN THE PAST 5 YEARS. THE FOLLOWING TWO QUESTIONS ARE JUST TO DETERMINE WHETHER OR NOT YOUR ORGANIZATION MEETS THESE CRITERIA.

Q.1 When was the last time your organization or firm was involved in or commissioned any new building construction or substantial renovations in Ontario? _

	new construction	renovation
1. within last 6 months	______	______
2. within last year	______	______
3. within last 2 years	______	______
4. within last 5 years	______	______
5. more than 5 years ago	______	______

_ _

IF ANSWER IS MORE THAN 5 YEARS AGO OR NEVER FOR BOTH NEW CONSTRUCTION AND RENOVATION, STOP. QUESTIONNAIRE NOT APPLICABLE. OTHERWISE CONTINUE.

Q.2 Has your organization ever retained an Ontario based firm offering building design services in the past 5 years?

1. for new construction? Yes ______ _ _
   No ______ → If applicable, were there any specific reasons for this?
   ____
   ____
   ____

2. for renovation: Yes ______
   No ______ → If applicable, were there any specific reasons for this? _ _
   ____
   ____
   ____

IF NO TO BOTH NEW CONSTRUCTION AND RENOVATION, STOP. QUESTIONNAIRE NOT APPLICABLE.

IF YES TO BOTH OR YES TO NEW CONSTRUCTION ONLY, ANSWER ALL THE REMAINING QUESTIONS WITH RESPECT TO NEW CONSTRUCTION ONLY THAT INVOLVED AN ONTARIO BASED FIRM OFFERING BUILDING DESIGN SERVICES

IF YES TO RENOVATION ONLY, ANSWER ALL REMAINING QUESTIONS WITH RESPECT TO RENOVATION THAT INVOLVED THE SERVICES OF AN ONTARIO BASED FIRM. READ CONSTRUCTION AND BLDG. DESIGN SERVICES AS RENOVATION IN THE REMAINING QUESTIONS. 1/13

DO NOT WRITE IN THIS SPACE

Q.3 Which outside professionals have been directly retained by your organization?

		in the last project	number of times in past 5 years	
1. project manager	engineer	___	___	_ _ _
	architect	___	___	_ _ _
	other	___	___	_ _ _
2. design-builder	engineer	___	___	_ _ _
	architect	___	___	_ _ _
	other	___	___	_ _ _
3. developer		___	___	_ _ _
4. builder		___	___	_ _ _
5. general contractor		___	___	_ _ _
6. architect		___	___	_ _ _
7. engineer-structural		___	___	_ _ _
8. engineer-mechanical		___	___	_ _ _
9. engineer-electrical		___	___	_ _ _
10. other (specify) ____________		___	___	_ _ _

Q4. With respect to your organizations' most recent involvement in building construction, what type of building was constructed?

01. residential - single __ _ _
02. residential - multiple, row __
03. residential - apt. & high rise __
04. hotel, motel __
05. Hostel, old age residence __
06. other institutional residential __
10. theatres, cinema, night clubs, auditorium __
11. church, rectory, chapel __
12. museum, art gallery, library __
13. hospital __
14. medical clinic __
15. school, college, university classrooms __
20. office commercial, bank __
21. retail commercial, shopping centre, restaurant __
22. mixed use bldgs. __
30. light industrial bldg. for processing, manufacturing __
31. heavy industrial bldg. __
32. warehouse, storage bldg. __
33. service & repair bldg., gas stations __
34. laboratories __
35. transportation terminal __
36. parking garages __
40. exhibition and recreational bldgs. & structures __
50. post office, firehall, police stations __
60. other (specify)

____________________ __

1/57

DO NOT
WRITE IN
THIS SPACE

Q5. In its past involvement in bldg. construction or renovation, has your organization ever taken on the role of project co-ordinator or project manager?

1. project co-ordinator yes___/no___
2. project manager yes___/no___ _

IF NO TO BOTH THEN GO TO QUESTION 8 OTHERWISE CONTINUE.

Q6. Why did your organization take on this role?

____ _ _
____
____

Q7. What has been your organization's experience in this role:

____ _ _
____
____

QUESTIONS 8 TO 21 ARE WITH RESPECT TO THE LAST PROJECT ONLY

Q8. Was the choice of a firm offering bldg. design services made from a number of possible alternatives.

2. NO → How was a firm chosen?_____________ _ _
1. YES
____
____

GO TO QUESTION 12

Q9. How were possible alternative firms offering bldg. design services generated? _

1. references from other organizations ___
2. professional bodies, APEO, OAA, CEO, ___
3. references from other firms offering bldg. design services ___
4. recommendation from prime consultant or project manager ___
5. on the basis of bldg. type ___
6. other sources (specify)

_____________________________ ___

1/65

Q10. Rank the following criteria in order of their importance to the decision to retain a firm or firms offering bldg. design services.

(RANK ONLY THOSE CRITERIA OF RELEVANCE. MORE THAN ONE CRITERION CAN HAVE THE SAME RANK. E.G. CRITERIA 1 & 2 COULD BE OF EQUAL IMPORTANCE TO YOU ; 1 = most important)

Q11. In which characteristics did the firms you were considering differ most? (e.g. did they differ most in size or price or proposals, etc.?) (USE THE SAME CRITERIA LIST)

DO NOT WRITE IN THIS SPACE

RANK	CRITERIA LIST	DIFFERING CHARACTERISTICS	
____	1. reputation of firms to complete project on time	____	_ _ _
____	2. reputation of firm to complete project within budget	____	_ _ _
____	3. reputation of firm in dealing with your problem area	____	_ _ _
____	4. reputation of firm for quality in building design	____	_ _ _
____	5. size of firm	____	2/ _ _
____	6. range of expertise of staff	____	_ _ 2
____	7. personal service from senior professional	____	_ _ _
____	8. specialized capabilities	____	_ _ _
____	9. compatability with own organization	____	_ _ _
____	10. on basis of proposal	____	_ _ _
____	11. on basis of price (fee)	____	_ _ _
____	12. references from prime	____	_ _ _
____	13. references from other firms in bldg. design	____	_ _ _
____	14. references from other organizations	____	_ _ _
____	15. geographic regions	____	_ _ _
____	16. previous experience with firm	____	_ _ _
____	17. decision was made by a political body	____	_ _ _
____	18. other (specify) ________________	____	_ _ _
	________________________		_ _ _

2/42

DO NOT WRITE IN THIS SPACE

Q12. Which departments and/or persons in your organization were involved in the course of the decision-making process to select and retain a firm or firms offering bldg. design services?

1. ____________ _ _
2. ____________ _ _
3. ____________ _ _
4. ____________ _ _
5. ____________ _ _
6. ____________ _ _
7. ____________ _ _
8. ____________ _ _
9. ____________ _ _
10. ____________ _ _

Q13. Did your organization have an adequate amount of information upon which to make a decision to retain a firm or firms offering design services?

1. Yes____ _ _
2. No ______→ What additional information would you have wanted to have?____
____

Q14. Who made the final decision to retain a firm or firms offering bldg. design services?

Q15. What has been the past experience of persons or dept. named in Q.14 in terms of their past involvement in making decisions to retain firms offering bldg. design services?

	no.of projects involved in	no. of years experience
1.________________	________	________
2.________________	________	________
3.________________	________	________
4.________________	________	________
5.________________	________	________

_ _ _ _ _ _

2/76

_ _ _ _ _ _

3/_ _ 3

_ _ _ _ _ _

_ _ _ _ _ _

_ _ _ _ _ _

Q16. Does your organization have in-house professional staff who advise on bldg. design?

1. professional engineers yes___ no___ _
2. non-registered engineers yes___ no___ _
3. engineering technologists or technicians yes___ no___
4. professional architects yes___ no___ _
5. non-registered architects yes___ no___ _
6. architectural technologists or technicians yes___ no___ _

_

3/27

DO NOT WRITE IN THIS SPACE

Q17. With respect to the last project, which aspects of the design work were done by your in-house staff or other members of your organization?

	all	some	none
1. basic concept	____	____	____
2. preliminary investigations	____	____	____
3. feasibility studies	____	____	____
4. preliminary design	____	____	____
5. provision of all data necessary for design of project	____	____	____
6. provision of all data necessary for construction of project	____	____	____
7. approval of preliminary design	____	____	____
8. scheduling of project	____	____	____
9. costing of project	____	____	____
10. detailed design	____	____	____
11. final cost estimate	____	____	____
12. contract administration	____	____	____
13. construction supervision	____	____	____
14. other (specify) ____________________	____	____	____

Q18. What was the method of payment used for design services?

1. % of construction cost ____
2. lump sum ____
3. time (per diem/payroll cost times a factor) ____
4. other (specify) ____________________ ____

Q19. What determined the type of fee used?

1. bldg. type ____
2. type of service provided (design/supervision of construction) ____
3. nature of the project ____
4. your own preference ____
5. preference of the firm retained ____
6. Other (specify) ____________________ ____

Q20. When, during the course of your overall involvement in the project, were fees for design services first discussed?

____

3/44

DO NOT WRITE IN THIS SPACE

Q21. With respect to your last project, what steps or measure, if any, did your organization take to determine if the proposed fee for bldg. design services was appropriate? ______________________________

____

____ __ __

THE FOLLOWING QUESTIONS ARE NOT SPECIFICALLY RELATED TO THE LAST PROJECT WITH WHICH YOUR ORGANIZATION WAS INVOLVED.

Q22. How do you rate your organization in terms of its being informed about the technical aspects of bldg. design? (circle answer) __

1	2	3	4	5
extremely informed				uninformed

Q23. How do you rate your organization in terms of its being informed about the economic aspects of bldg. design? (circle answer) __

1	2	3	4	5
extremely informed				Uninformed

Q24. Are there any specific things upon which an organization such as yours can rely to ensure that it is getting what it pays for in bldg. design services when an architect, engineer or other professional is retained?

	architect	engineer	other	
Yes → 1. reputation of the firm retained	____	____	____	__
2. regulatory agencies such as municipal bldg. dept. etc.	____	____	____	__
3. professional bodies - APEO, OAA, etc.	____	____	____	__
4. professional ethics	____	____	____	__
5. liability insurance	____	____	____	__
6. terms of contract	____	____	____	__
7. exercise of approval	____	____	____	__
8. other (specify) ____________________	____	____	____	__

No → Why not? ____

____

____

____ __ __

3/58

DO NOT WRITE IN THIS SPACE

Q25. Does your organization ever technically assess the finished product, e.g. building?

	Using in-house staff	using outside consultant
1. Yes	______	______
2. No	______	______

Q26. What other, if any, procedures does your organization use to determine if it has got a good product?______________________________
____
____

Q27. On the basis of your experience is there any relationship between the amount you pay for design services and the quality of the design work done? What are the reasons for your answer?______________________________
____
____

Q28. How influential are the APEO/OAA fee schedules in determining the size & type of fee charged for design services?

	APEO	OAA
1. use as guide	____	____
2. depends on project size	____	____
3. not at all	____	____

Q29. RANK the following costs which could be associated with a project, in their order of importance to you. (RANK, 1 = MOST IMPORTANT, 6 = LEAST IMPORTANT. AGAIN, MORE THAN ONE COST CAN HAVE THE SAME RANK).

type of cost	rank
1. land acquisition	____
2. site development	____
3. professional design services	____
4. construction costs	____
5. operating & maintenance costs over life of bldg.	____
6. other costs (specify) ______________	____

Q30. Are you aware of significant quality differences among firms offering bldg. design services?

amongst architectural firms: yes___ no___
amongst engineering firms: yes___ no___

Q31. What do you see as being the role of an architect in bldg. design?
____
____
____

Q32. What do you see as being the role of an engineer in bldg. design?
____
____
____

3/76

DO NOT WRITE IN THIS SPACE

Q33. From your past experience, who has been the better project co-ordinator?
1. architect ___
2. engineer ___
3. depends on the project ___
4. other (specify)
______________________ ___

_

Q34. Who do you consider to be better in the financial aspects of bldg. design & construction?
1. architect ___
2. engineer ___
3. depends on the project ___
4. other (specify)
______________________ ___

_

Q35. Who do you consider to be better in terms of completing the project within your time constraints?
1. architect ___
2. engineer ___
3. depends on project ___
4. other(please specify)
______________________ ___

_

Q36. How are communications between your organization and other professionals in bldg. design who have been retained by the prime consultant?

1. if architect is prime	- good	___	_
	acceptable	___	4/_ _ 4
	poor	___	
2. if engineer is prime	- good	___	_
	acceptable	___	
	poor	___	
3. with other prime consultant (specify) ______________	- good	___	_
	acceptable	___	
	poor	___	

Q37. Has your organization encountered major problems in its past involvement in bldg. design such as quality of design work, negotiation of fees, coordination of design, etc. IF SO, PLEASE BE AS SPECIFIC AS POSSIBLE. (IF NO PROBLEMS GO TO Q41)

_ _

____
____
____
____
____

4/7

DO NOT WRITE IN THIS SPACE

Q38. Were these problems encountered with an architectural, engineering or other firms offering design services?

	architect	engineer	other
1. yes	___	___	___
2. no	___	___	___

Q39. How were these problems resolved?______________________________

Q40. Were you satisfied with the resolution?______________________________

Q41. Has your organization, in the past 5 years, directly contracted with engineering or architectural technologists, technicians or other paraprofessionals for various aspects of building design?

	architectural paraprofessional	engineering paraprofessional
1. yes	_____	_____
2. no	_____	_____

IF NO TO BOTH, GO TO Q43. OTHERWISE CONTINUE

Q42. What have been the reasons for retaining paraprofessional design services directly?______________________________

Q43. Are you generally satisfied with the quality of the work done by paraprofessional staff of the firms that you have retained for design services?

	engineering firms	architectural firms	other firms
1. yes	___	___	___
2. no	___	___	___
3. don't know	___	___	___

Q44. Does your organization insist that certain aspects of bldg. design be done by professional architects or engineers rather than by paraprofessional staff of professional consulting firm? If so, what are the reasons for this?______________________________

ADDITIONAL COMMENTS

4/22

APPENDIX C

CASE STUDIES

I. INTRODUCTION TO CASE STUDIES

The following case studies were undertaken to examine the working relationships and division of responsibility between architects and engineers in the course of site selection, program development, planning for construction, design, and actual construction of a major capital development project.

The first of the two projects selected is the Ontario Correctional Institute at Brampton, a medium security facility housing up to 200 inmates and devoted primarily, though not exclusively, to clinical diagnosis and treatment. The Institute was completed in 1973 by the engineering firm of Giffels Associates Ltd. for the Ministry of Government Services (the purchaser or administrative client) to meet the requirements of the Ministry of Correctional Services (the user client) on behalf of the Institute's staff (the actual users).

The second is the Metropolitan Toronto Library at Yonge Street and Asquith Avenue in Toronto. Planning for the new library, scheduled to open in late 1977, began in 1968 with the establishment of a Site and Building Committee (agent of the client) by the "Metropolitan Toronto Library Board" (the client). The firm of Raymond Moriyama Architects and Planners was retained first to prepare a site selection and feasibility study, later to compile a detailed building program, and finally, to assume responsibility for the design of the building and supervision of its construction.

Each study will trace the respective project's history and the intentions behind its inception - thereby introducing all the participating parties in the order in which they became involved. Attention is focused in both cases on the working relationships established between architects,

engineers, and client groups: the allocation of responsibilities; the procedures employed and the nature of the expertise required to handle each of the projects' phases from program definition, through preliminary sketch designs, project planning (scheduling and cost estimation), approvals, final design, preparation of working drawings and specifications, and construction management.

Following the separate descriptions of the projects is a summary of the findings as to which aspects of the design process were in each case shared, in conflict, or distributed between professional engineers and architects. The findings are discussed in terms of the separate procedures employed during the course of the design process; the fundamental concerns manifest at all stages of the process (viz. to ensure human health, safety,and security; to accommodate the human activity for which the building was intended; and for user response to the completed building); and the perceptions regarding the above issues of those who participated in the project's development.

Information for the studies was compiled as follows: For the Ontario Correctional Institute: files kept by Giffels Associates Ltd., particularly, the original operational program prepared by the Ministry of Correctional Services, the definitive planning report compiled by Giffels, the minutes of interviews, design, and site meetings and interviews with representatives of the participants whose time and energy is greatly appreciated.

For the Metropolitan Toronto Library: files kept by the Metropolitan Toronto Library Board and the City of Toronto Planning Board, interviews with representatives of the participants including the Library Board, architect, engineers, construction consultant, municipal planning and building officials, and a representative of the local residents' and businessmen's groups.

Information for both studies was also obtained from site visits and from the acts pertaining to each profession.

III ONTARIO CORRECTIONAL INSTITUTE - CASE STUDY

Preliminaries and Participants

Sometime in the mid-60's, the staff of the Alex G. Brown Memorial Clinic, a correctional facility situated on a former farm in Mimico, were asked by the Ministry of Correctional Services to provide ideas for renovating the clinic's facilities. The desire to provide expanded clinical services, coupled with the fact that most of the buildings on the site had never been intended for the use to which they were being put, led to the suggestion that an entirely new facility, rather than a renovation of the old, might better serve the clinic's purpose.

The original intention was that the farm-like setting - with its separate buildings for cottages, workshops, and therapy rooms - would be duplicated in an enlarged, modern institution. By the time the proposal for a new facility was given serious attention by Correctional Services in 1970, however, familiarity with the cost of heating the Vanier Institute's separate buildings, and with other winter-related problems, had persuaded the staff that a single building would be more suitable.

The staff's major attention then focused on ensuring that the new clinic would be light, airy, as "non-institutional" as possible, and in conformity with the requirements of their clinical and therapeutic programmes. Continuous input from the staff (the actual client) was obtained throughout the course of the project, primarily through the involvement of the institution's Assistant Superintendent of Services, Norman Crampe, who met frequently with representatives of all the other participating parties.

Despite the ongoing involvement of the institute's staff, it was - of course - Correctional Services that was formally the user client and therefore charged with defining the clinic's requirements and ensuring that they were met. Under the direction of the Ministry's Chief of Facilities Design Planning - Stephan Lendvay, an architect - psychologists, psychiatrists, and correctional workers spent considerable time developing an operational program for the diagnostic and treatment clinic which was to house offenders addicted to drugs or alcohol, or who engage in sexual deviation. Facilities elsewhere in Canada and the U.S. were studied, and ideas from these, as well as from the Mimico clinic's staff, were incorporated into the program for the new building.

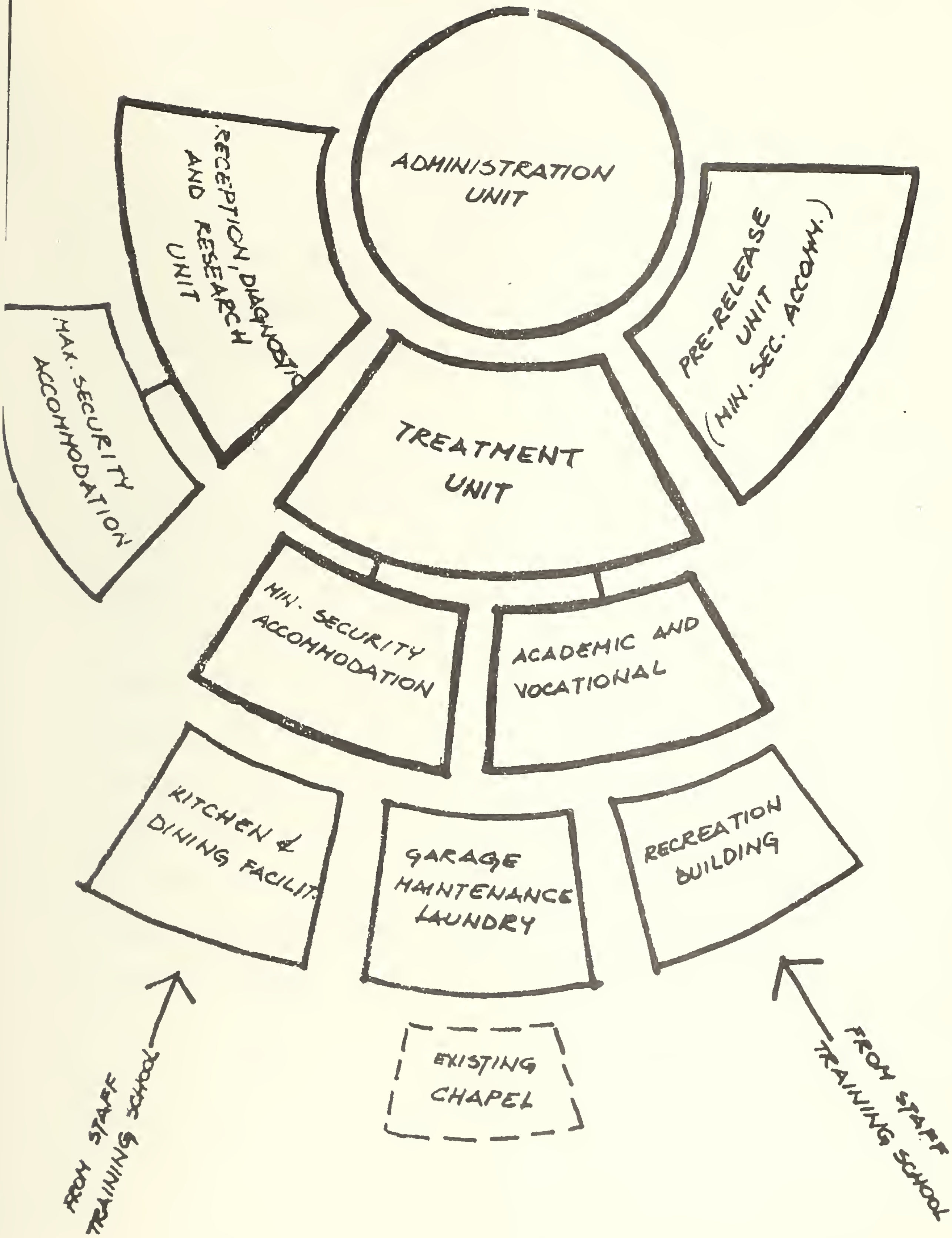
Although a fairly detailed document, the program, "Design Requirements, Department of Correctional Services, Proposed New Clinical Facilities, Brampton", did not represent an attempt to define the actual layout of the clinic as a whole, or even of its component parts. Rather, it spelled out the types of units required (diagnostic, administrative, vocational and academic, accommodation, etc.), their size, anticipated numbers of users, the degree and type of security required in each, and - by using simple diagrams (see attached) - the functional and physical relationships between them.

Brampton was chosen as the site for the new facility for two major reasons. First, adjacent to the Vanier Institute were an additional twenty acres already owned by the province and long earmarked for use by Correctional Services. Use of this land avoided both the cost of acquiring land elsewhere, and the opposition encountered in communities

not already hosting correctional facilities. Secondly, Brampton's proximity to Toronto makes it highly accessible to the psychiatric and medical practitioners needed to staff a facility of this type.

Having established the overall size, 160,000 sq. ft., and approximate equipment requirements, it was possible for Correctional Services to prepare a "guesstimate" as to the building's cost. Following approval by Management Board, close to $6,000,000 were allocated to the Ministry of Government Services, which acts as administrator for all the government's construction projects. As administrator, Government Services makes all day-to-day decisions, controls all expenditures, selects the firm(s) that will design and construct projects, and is responsible for satisfying the user's requirements. Formally its role is to serve as the liaison between the user and the firm responsible for the project; all communications, including design decisions, are filtered through Government Services - despite the fact that the actual decision-making rests with the user. As within Correctional Services, the chief Government Service representative for the project, Gabor Pongor, was an architect.

As indicated previously, the firm selected for the project was Giffels Associates Ltd. a mixed firm (as we have defined mixed firms in the body of this working paper) offering a range of consulting services including planning, project management, and design. Upon receiving the contract in November, 1970, Giffels assigned several of the architects then in its employ to the job, selecting one, Charles Meek to be project manager. Giffels undertook the work on a project management basis, meaning that of all aspects of the project - from program refinement through supervision of construction - many would be handled in-house.



FUNCTIONAL GROUPING

PROPOSED NEW CLINICAL FACILITIES - BRAMPTON

It is difficult to evaluate the basis for the selection of Giffels to do the job. In this particular instance, however, there were two unusual aspects to the selection. The first is that such contracts are generally awarded to architectural firms, not to engineering firms; the second, that this was Government Services' first - and thus far, only - forray into project management. The more common practice is for either the client or the architect to hire the consultants required for the project's completion.

Two other somewhat unusual aspects are worth keeping in mind before moving on to a detailed description of its management. First, after years of delaying the start of the project, Correctional Services, once embarked on it, decided its completion was of the utmost urgency and accelerated the entire process. As a result, only two years were allowed from the time the contract was awarded to complete a project that would otherwise have been expected to take at least three years. As will be seen, this necessitated extremely tight scheduling of all phases of the project, and resulted in the somewhat unusual situation of the onset of construction preceding the finalization of plans, completion of the working drawings,and the preparation of a complete contract package.

Secondly, the formal relationship of Government Services to the user client and the architect, whereby all correspondence and communication between the two is filtered through it, was altered in this case. As can be imagined, the imposition of a third party between user and architect can be a nuisance for any but the most standardized of projects, hampering the architect's ability to determine the client's needs, and slowing down the decision-making process. It is not unusual to circumvent this formality during certain phases of a project. In the case of the Brampton facility, an alternative communication pattern was established to permit not only Correctional Services and the architect to meet throughout the course of the project, but also to draw into discussions the eventual users of the building, the Institute's staff members. Even knowing precisely for whom a building is intended is unusual on a large or government-sponsored project, let alone being able to meet with them on a regular basis. It has been suggested that the novelty of the facility added to all parties' willingness to deal with the project as flexibly as possible.

Design Function

Once hired, Giffels became the party bearing primary responsibility for all aspects of the project's management and execution. The bulk of the firm's work is in the field of industrial accommodation - plants, warehouses, laboratories, and related structures. Under most circumstances, their standard operating procedure consists of calling together individuals representing the disciplines required for a given project

to collectively work out a preliminary layout. Each participant then produces a study indicating his conception of the final product. The structural concerns that were manifest in the preliminary layout determine the materials chosen and the methods of construction, the size of the materials required, floor and wall thicknesses, and costs. The project manager collects all the data, and compiles a report describing the building, materials, servicing methods, and price. Alternative suggestions from the respective disciplines are weighed to produce the most economical building.

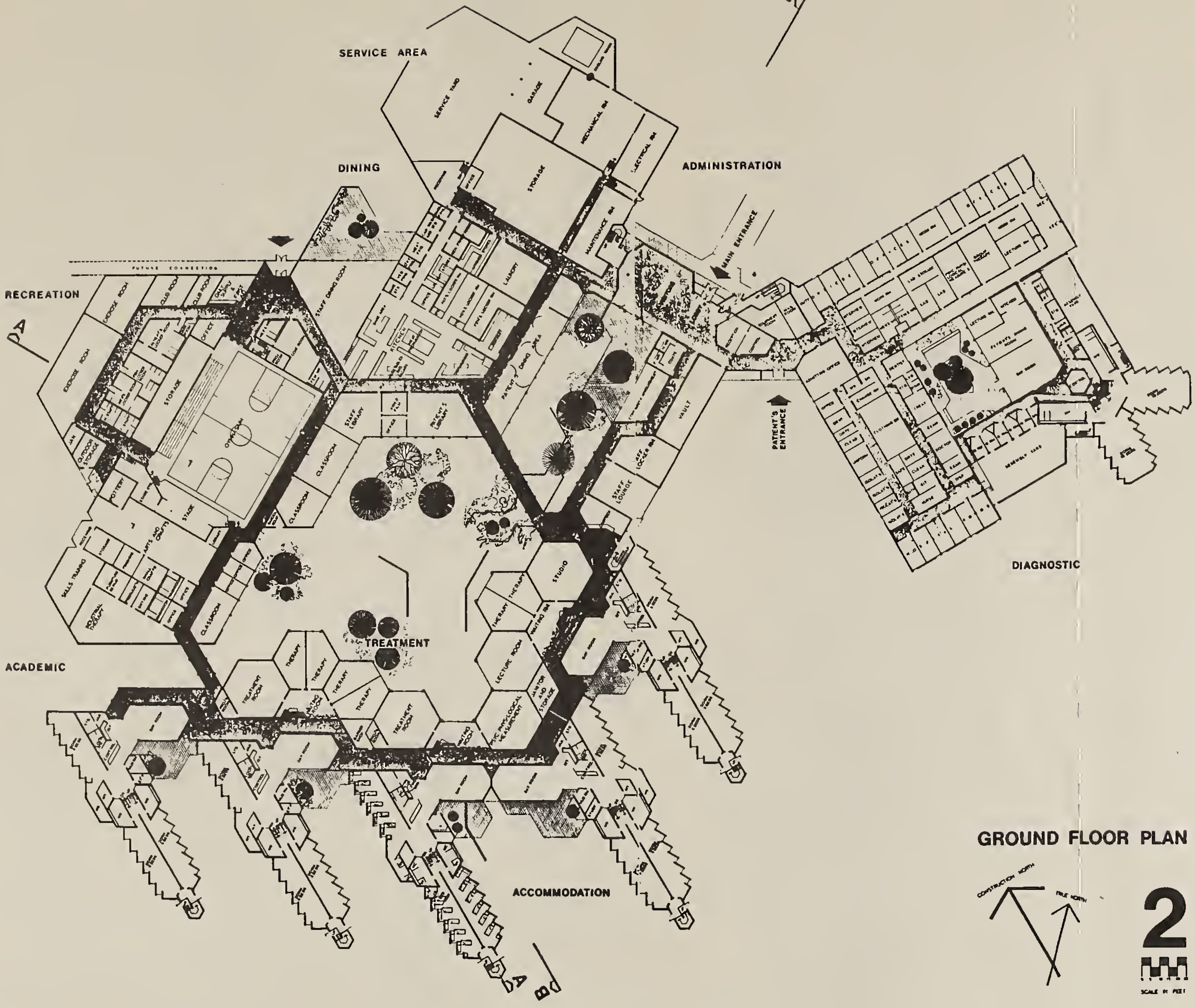
The report provides a tool for the owner so that he knows what to expect. The information contained therein will also determine Giffel's manpower allocation, and make the task of the members of each discipline far easier when it comes to designing the individual systems contained in the structure. The project manager is the one whose stamp appears on the final working drawings, though each discipline is responsible for its own work, and project engineers are required to stamp their own drawings rather than having the firm's owners or department heads do it.

In the case of the Brampton project, basically the same procedure was followed in that one of the aims of the first six months of work was the production of a definitive planning report to provide both client and firm with detailed information on scheduling, cost breakdown estimates, methods of construction, contracting procedures, servicing requirements, and layout; and in that this document became the basis on which the client's approval to proceed with construction was sought and obtained.

The usual procedure differed, however, in that the project manager selected for the job was an architect rather than an engineer, and that it was he who was charged, in the preliminary stages, with developing the layout for the building with the assistance of other staff-architects, instead of working from the outset on a collective, totally interdisciplinary basis. Yet because of the provisions in the Architects Act covering architects in the employ of incorporated firms such as Giffels, the final drawings - including those done by registered architects - were stamped by engineers even though an architect served as project manager, and his responsibilities for all aspects of the project were on a par with those assumed by an architect practising under his own name.

The reasons for utilizing slightly different procedures on this job are, as noted above, that the majority of Giffel's work is for industry. Often the industrial processes being accommodated impose layout requirements that make the layout as explicitly defined from the outset of the project as the range of room temperatures might be in a residence.

The Brampton facility's program provided no such definitive requirements. The architect's first task, as is typical of most architectural projects, was to interpret the client's needs by refining the initial program, and translating its requirements into physical form. What the program made clear was that as non-institutional a setting as possible was desired by the client. And while the



CLINICAL FACILITIES. BRAMPTON ONTARIO

FOR THE DEPARTMENT OF CORRECTIONAL SERVICES
DEPARTMENT OF PUBLIC WORKS

MINISTER DEPUTY

Giffels Associates Limited

program did define the various areas required within the building, the degree of detail was insufficient to immediately proceed with design of the facility. The first several weeks, therefore, were spent going over every page of the program, with the various client groups figuring out how staff, inmates, and visitors would be expected to use each part of the building, move from it to the adjacent unit, and use and store equipment provided in each room. Every aspect of lighting, servicing, daily activities, circulation, and security had to be questioned and precisely described. Through this review process, the architect obtained a clear understanding of the client's needs, and began to formulate a design to accommodate them. It is worth noting that many aspects of the detailed program developed for this job, in combination with those compiled by architects at Correctional Services, have since become standardized in other similar institutions, thereby reducing the time required for program definition.

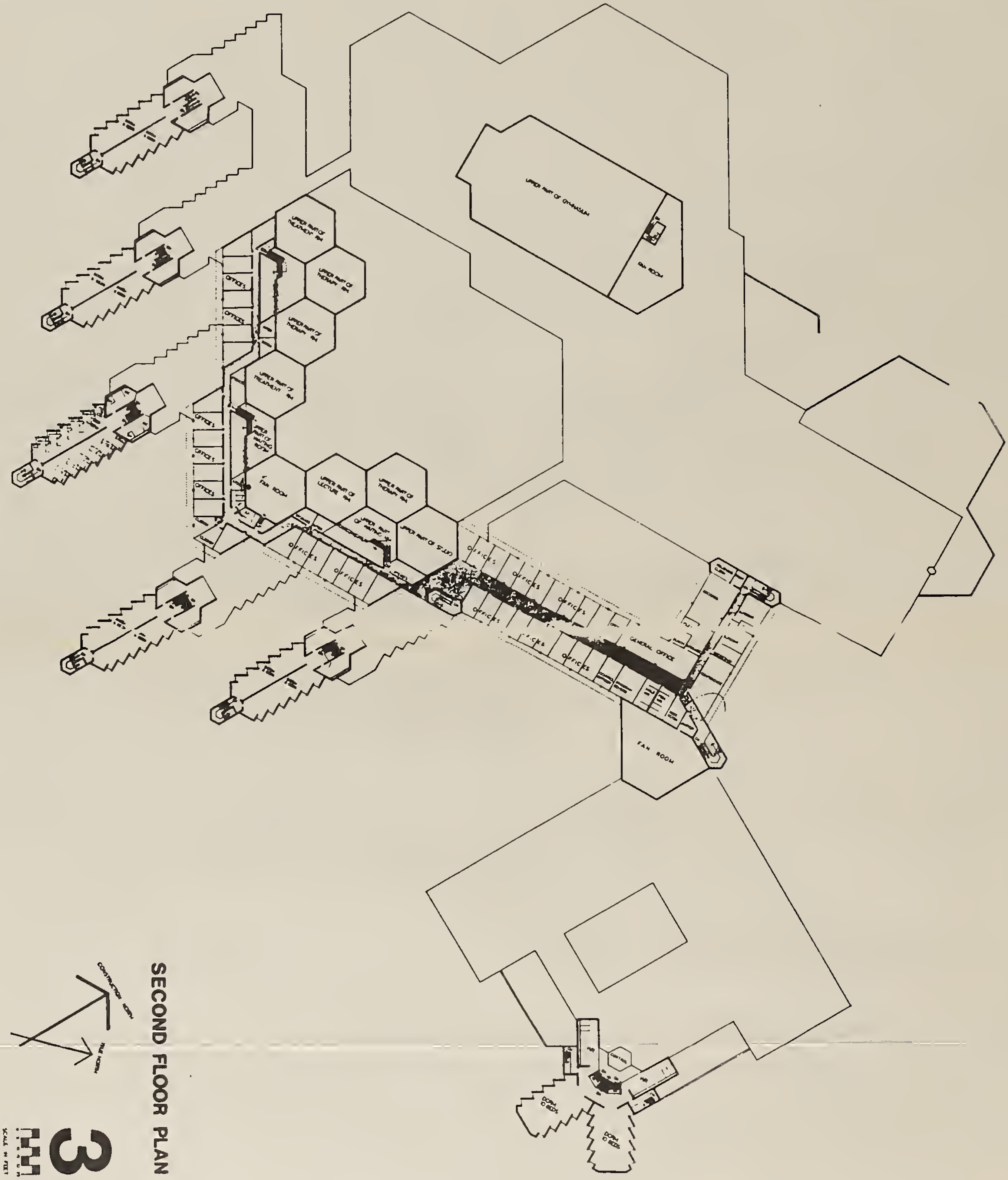
As this stage proceeded, the entire design team - electrical, mechanical, and structural engineers - were brought into the discussion. Their presence served a dual purpose: they became acquainted with the requirements of the project; and they were able to contribute information relevant to the design.

Out of these discussions, which included both "interview" meetings with the clients and design sessions with Giffels, emerged the concepts on which the final plan of the building depends (see attached plans). For instance, the building's users were adament about having as much natural light as possible throughout the building, especially in those areas receiving heaviest use. From this requirement came the idea of

designing the different sections of the building around courtyards, and placing activities rooms - dining areas, class rooms, therapy and meeting rooms, etc. - around their perimeters. This configuration also permitted the building to serve as its own wall, eliminating the need for a fence. Similarly, the psychologists' demand that their therapy rooms not be rectangular but "roundish", capable of seating people without leaving anyone stuck in a corner, can be seen to have generated much of the plan of the building as a whole. Other ideas central to the building's design include the elimination of the long, straight, double-loaded corridors generally associated with institutional settings, and the provision of privacy for each inmate despite the use of dorms rather than individual rooms or sells.

In January of 1971, less than two months after starting the project, sketch designs had progressed sufficiently to enable the client to choose between a configuration resembling the one ultimately constructed, and a simple more traditionally institutional box. The former was felt to embody more thoroughly the requirements of a treatment clinic, and was the basis from which Giffels proceeded to compile a definitive planning study.

Once the initial sketch design had been accepted, work proceeded on all aspects of the project. Because of the building's function, sturdy and specialized furnishings and fittings - beds, locks, drapes, closets, and colours, textures, and acoustic properties - had to be selected, designed, and accommodated in the overall plan. As the minutes of the meetings show, specialists were brought into the process as required.



SECOND FLOOR PLAN

CLINICAL FACILITIES. BRAMPTON ONTARIO

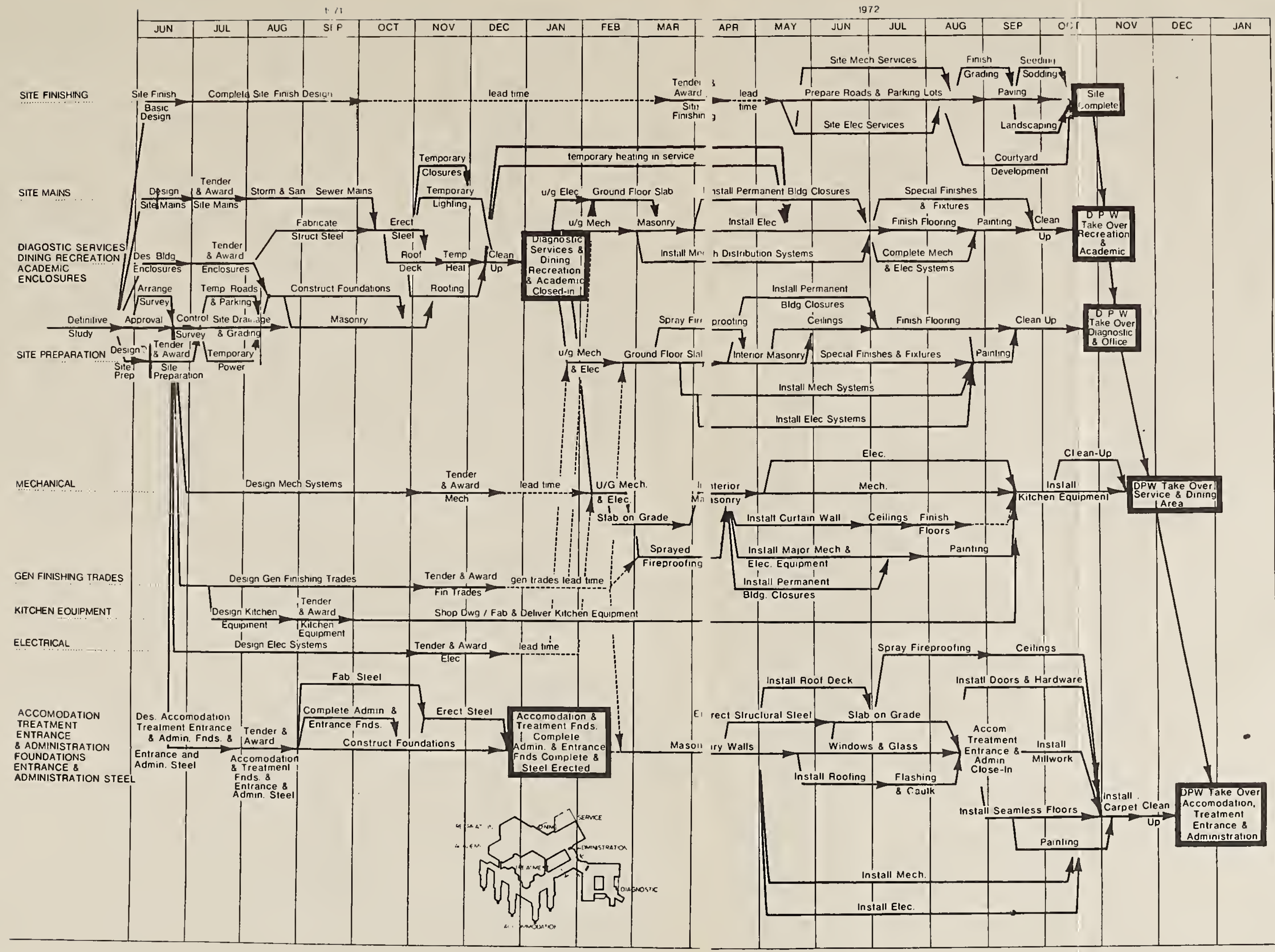
FOR THE DEPARTMENT OF CORRECTIONAL SERVICES
DEPARTMENT OF PUBLIC WORKS T.B. GILLIARD DEPUTY MINISTER

Giffels Associates Limited
CONSULTING ENGINEERS PROJECT MANAGERS

The need for a sophisticated electrical system for security purposes, for instance, meant that the project's electrical engineer became involved far earlier than might have been the case had the building been intended to serve a purpose other than that of a prison. Similarly, a scheduled discussion of hydro connections, fire exits, or therapy rooms signalled a visit from the hydro man, the fire marshall, or a psychologist.

By this time, the building's layout, servicing systems, and materials were not the only things being designed. The logistics of scheduling both contracts and construction had to be developed. As mentioned earlier, the fact that this was an accelerated project meant that some typical procedures were altered. Whereas Giffels would normally devote approximately six months to preliminary design, and then an additional six to eight to prepare a complete set of working drawings and a contractual package for all trades, here construction actually got underway prior to the completion of either working drawings or a contractual package (see attached schedule).

In addition, the construction schedule was designed so that the exterior shells of the building's different units could be erected, and some areas - namely the diagnostic, dining, recreation and academic wings - enclosed before winter set in, permitting their interiors to be worked on throughout the cold months. This construction staging method entailed arranging for temporary servicing of the building so that workmen could work inside.



CLINICAL FACILITIES. BRAMPTON ONTARIO

FOR THE DEPARTMENT OF CORRECTIONAL SERVICES

DEPARTMENT OF PUBLIC WORKS

Giffels Associates Limited
CONSULTING ENGINEERS

PLAN REPORT

CLINICAL FACILITIES
BRAMPTON, ONTARIO
FOR THE
DEPARTMENT OF CORRECTIONAL SERVICES

Project No. C0058
18 June 1971
Revision 1

DEPARTMENT OF PUBLIC WORKS
TENDERING CONTROL

Contract No.	Contract	Qualification Date	DPW Approve Package	Issue Tender Documents	Tenders Due	Award Contract
101	Site Prep.	June 7/71	June 9/71	June 15/71	Jun 24/71	July 5/71
102	Enclosures For Diagnostic Services, Dining Recreation, Academic, Site Mains	July 5/71	July 6/71	July 12/71	Aug [illegible]/71	Aug 12/71
103	Foundations for Accommodations, Treatment Entrance and admin. also steel for Admin.	July 23/71	July 26/71	July 30/71	Aug. 20/71	Aug 26/71
7101	Kitchen Equipment	Aug. 25/71	Aug. 26/71	Sept. 1/71	Sept. 27/71	Oct. 4/71
104	General Finishing Trades	Nov. 5/71	Nov. 9/71	Nov. 15/71	Dec. 16/71	Dec. 23/71
105	Mechanical	Nov. 17/71	Nov. 12/71	Nov. 18/71	Dec. 8/71	Dec. 23/71
106	Electrical	Nov. 12/71	Nov. 15/71	Nov. 22/71	Dec. 10/71	Dec. 23/71
107	Site Finishing	Mar. 8/72	Mar. 9/72	Mar. 15/72	Apr. 7/72	Apr. 14/72

This also allowed the design itself to proceed on a piecemeal basis, the exterior shells being completed in advance of the interior spaces. In fact, design of some areas, such as the reception area, was completed long after many other paths of the building were standing and finished.

Construction was divided into several contracts awarded on a sequential basis and pre-purchasing was organized similarly. Both were related to the availability of material, the time available for detailed design, drawings, specification writing, the relationship of each aspect of the work to other contracts, and the nature of the work involved. As the design of the work in each separate contract was developed, estimates of the amount of each contract were made, thereby amending or breaking down further the cost estimates prepared for the definitive planning study. A final difference lay in the pre-qualification of bidders. Standard government practice requires advertising for competitive bids from contractors. In this case, an advertisement was run inviting not tenders, but applications with brief descriptions of the contractor's experience. Between six and eight contractors were selected for each contract by Giffels and Government Services, and these alone were invited to bid. The procedure, like those above, was intended to save time.

All of these arrangements were unusual, some had never been utilized by Government Services previously (or since), but none involved skills other than those typically deployed for the design and construction of a project.

By the end of May, 1971, Giffels had completed the planning document discussed above. As indicated, in addition to the basic layout, described and explained on a trip-through-the-building basis, it presented a comprehensive study of the project's planning, estimated construction costs, and the contractual arrangements that would govern the development of design and construction. Outline specifications and layouts illustrated the facility and all the principal elements and systems involved in the project, including information relating to design criteria and construction standards. The cost estimates were broken down to their component parts by anticipated monthly disbursements as well as by contract (see attached cost estimates).

Once assured that the client's needs were being met, Government Services was responsible for approving the document's contents, and authorizing the tendering of contracts and of construction start-up. The study was reviewed carefully not only by the Government Services architect responsible for the project, but by the ministry's in-house engineers, whose specialities paralleled those of Giffel's staff. Approval was given, and the project moved ahead as planned.

Weekly site meetings were convened throughout the construction process. The standard supervisory tasks fell to both architects and engineers from the firm. These included discussions with contractors regarding scheduling; discrepancies between drawings; labour supply problems; last minute choices and changes; difficulties arising from unanticipated conditions in the terrain, the weather, and from manufacturing and delivery delays; testing and approval of materials;

A major breakdown of the construction cost is as follows:

A.	Site Preparation and Temporary Services	$ 233,400.
B.	Site Development	399,700.
C.	Site Mechanical Systems	109,500.
D.	Site Electrical Systems	189,000.
E.	Clinic Complex	4,806,500.
F.	Reimbursements	128,500.
	Estimated Total Site Development and Building Cost	$5,866,600.
G.	Clinic Equipment (see Note 1)	125,000.
H.	General Costs	655,000.
	TOTAL	$6,646,600.

NOTE:

1. This amount includes only a limited allowance for kitchen and servery equipment. Full information and a budget relating to equipment is presently being developed by Department of Public Works personnel and is not available at this time.
2. The estimate does not include costs for the hockey rink, baseball fields and field house for which costs are estimated to be $68,000.

H. <u>General Costs</u>:

01.	Investigations	By D.P.W.
02.	Project Planning	$ 60,000.
03.	Design Fees	$ 290,000.
04.	Project Construction Management	$ 270,000.
05.	Reimbursements	$ 30,000.
06.	Approvals	$ 5,000.

TOTAL "H" $ 655,000.

TOTAL ESTIMATE $6,646,600.

H. General Costs: This section outlines estimates for costs associated with design and project management activities generally performed by Giffels Associates Limited. Reimbursements indicated in this section are not considered construction costs for purposes of this estimate.

01. Investigations: Includes miscellaneous investigations required in order to develop design.	A. Soils	By D.P.W.		
	B. Topographical Surveys	By D.P.W.		
02. Project Planning: Costs of design and project planning studies are included in this item.	A. Studies		$	60,000.
03. Design Fees: Fees for architectural and engineering services are included in this section.	A. Architectural/ Engineering Fees		$	290,000.
04. Project Construction Management: This item is the estimate of cost for project and construction management services.	A. Project/Construction Management Services		$	270,000.
05. Reimbursements: Travel and communication costs estimated in this section are those incurred directly by Giffels Associates as project and construction management and design personnel.	A. Travel	$ 15,000.		
	B. Communications	$ 5,000.		
	C. Computer services	$ 10,000.		
	D. Added management and design services	$ No allowance	$	30,000.

H. General Costs: (continued)

05. Reimbursements: (continued)

No allowance is included for additional architectural/engineering and management services which may result from significant changes in requirements in scope as the program develops. Such services may also be required in connection with the equipment and furnishing items which are not included in this report.

06. Approvals: Costs associated with design approvals by authorities having jurisdiction are included in this item.	A. Department of Labour		$ 5,000.
		TOTAL "H"	$ 655,000.

ESTIMATED CASH FLOW

Time Period	By Month	Cumulative Total
Prior to June 1971	$ 35,000.	$ 35,000.
June 1971	35,000.	70,000.
July 1971	65,000.	135,000.
August 1971	125,000.	260,000.
September 1971	240,000.	500,000.
October 1971	240,000.	740,000.
November 1971	240,000.	980,000.
December 1971	205,000.	1,185,000.
January 1972	115,000.	1,300,000.
February 1972	305,000.	1,605,000.
March 1972	300,000.	1,905,000.
April 1972	275,000.	2,180,000.
May 1972	360,000.	2,540,000.
June 1972	462,000.	3,002,000.
July 1972	490,000.	3,492,000.
August 1972	502,000.	3,994,000.
September 1972	540,000.	4,534,000.
October 1972	500,000.	5,034,000.
November 1972	380,000.	5,414,000.

Time Period	By Month	Cumulative Total
December 1972	$360,000.	$5,774,000.
January 1973	195,000.	5,969,000.
February 1973	595,000.	6,564,000.
March 1973	82,600.	6,646,600.

safety; and approvals resulting from any of the above. Problems with particular aspects of the building or its component systems were handled by those who had initially been responsible for their design. The building was completed on time and within the budget.

Only one major change was made subsequently. About three-quarters of the way through construction, Correctional Services altered the function of the facility - hence the name change from Clinical Facilities" to "Ontario Correctional Institute". It was originally anticipated that an inmate (then referred to as a patient) would spend his entire sentence at the clinic, arriving directly from the jails following sentencing. The disorders intended to be treated were alcohol and drug abuse and some forms of sexual devience. Because of the shortage of facilities throughout the province, treatment is not restricted to these categories, and many inmates (now called residents), are being transferred to and from other prisons rather than coming directly from jail. The only significant difference this has made in the building's capacity to function adequately is that some changes have been made, or are deemed desirable, in the diagnostic wing, which now houses men whose problems and likely behaviour are unknown rather than known. As a result, some design features intended to offer privacy appear to offer a refuge for delinquency instead. (An analysis of the roles and responsibilities of those involved in the design of the Ontario Correctional Institute will follow the Metropolitan Toronto Library case study.)

V. METROPOLITAN TORONTO LIBRARY CASE STUDY

In 1967, shortly after its inception, the Metropolitan Toronto Library Board, which is empowered to acquire land for its purposes, erect and maintain buildings, and to sell, lease or otherwise dispose of properties following approval from Metro Council, decided to proceed with planning for a new building to house central reference and other library facilities. In the board's view, the existing facility at College and St. George Streets was too close to the University of Toronto, lacking a Metro image, inaccessible to many Metro residents, poorly arranged, and despite recent additions and alterations, too small and incapable of meeting the needs of a growing library service. Further additions and alterations were deemed uneconomic and impracticable.

In 1968, the Board established a five-member Site and Building Committee to investigate and report on the requirements of a new library, potential sites, and the most desirable means of proceeding with the project. The Board and its staff began in consultation with area boards and chief librarians, to determine the basic purposes the proposed facility was to serve. Discussions were also held with the Metro Commissioner of Planning to consider available sites. Four of those examined appeared best able to meet the needs the Board had begun to formulate.

It became evident that it would be advisable to retain outside experts to undertake an exhaustive site selection and feasibility study, and in April, 1969, the Board requested funding for such work from Metro Council. Some thirty architectural firms expressed interest in the commission, and representatives of seven were interviewed.

In September, 1970, the Board selected Raymond Moriyama Architects and Planners, a well-established medium-sized firm employing approximately 25, to undertake the study. In addition to investigating alternative sites, Moriyama was asked to prepare a preliminary program and a conceptual design. The Board agreed to pay a fixed fee that would be deducted from any future fees were Moriyama subsequently selected as project architect. As it turned out, two years later Moriyama was hired to prepare a detailed building program, and one year after that as project architect.

After his appointment, Moriyama met with the Board to establish terms of reference for the study, site selection criteria, and the scheduling of approvals. At his suggestion, Albert Bowron, a media and library consultant, was also retained in order to conduct a user's study. Moriyama and his consultants met with the Board, its staff, and with librarians to determine the range of the new library's functions and likely space requirements, and with Metro and City Planning Board officials to discuss the availability and relative merits of potential sites. In all, seventeen sites were analyzed and rated with the three scoring highest studied in detail. Of these, the site at Yonge and Asquith rated highest, and was the one recommended.

In November 1971 the study was completed and made public. Response to the report, which had been circulated to area library boards and librarians, to Metro and municipal councils and departments, to local residents' and businessmen's associations, and to other organizations, was mixed. The Toronto Planning Board, for instance, indicated a preference for the Yonge-Gerrard site, primarily because of the library's

potential for stimulating development in that area. Local residents' and businessmen's groups in the Yonge-Asquith area, on the other hand, were generally pleased with the recommendations. They did express concern, however, with some aspects of the study's planning and programming proposals. In particular, they contended that inadequate provision had been made for computer, telex and video facilities, and were distressed that no direct access to the subway had been indicated. They were assured that these factors would be dealt with as the project progressed.

In June 1972, Moriyama was retained to prepare a detailed building program projecting space requirements for each library department or facility to 1985. As the preparation of the program proceeded, action took place on a number of other fronts as well. By December, the OMB had approved a $7,000,000 expenditure for acquisition of the site and project-related professional expenses. Between February and May of 1973, approximately two-thirds of the property required had been purchased, and expropriation proceedings were initiated for the remainder. Several discussions were held among representatives of the Board and its architects, the City and Metro Planning Boards, Metro Roads and Traffic and City Public Works concerning such planning issues as vehicular and pedestrian circulation, setbacks on Yonge Street, and Asquith, a proposed extension of Yorkville Avenue through the site, density, possible accommodation commercial uses within the building, and the extent to which public information and input were necessary.

The last of these issues was to become increasingly important as the project progressed. Local residents' and businessmen's associations in the area joined together in March of 1973 to form the North Midtown Planning Group which was designated by the City Planning Board to assist in the preparation of a secondary plan for the area. Later that year a subcommittee of the Planning Group was set up to consider the proposed library. Its membership, which included several architects, was later to voice strong opposition to many aspects of the project's design. With the backing of the City Planning Board, the Planning Group was able to force delays in the project, and to alter substantially several major features of the building's design.

In May 1973 Moriyama presented the detailed building program to the Board, and was appointed as project architect. Approval was also given to proceed with the project using the Project Team Management with construction consultant approach recommended by Moriyama, and to plan on proceeding with sequentially awarded constructs during the construction phase.

Moriyama had utilized a similar method on previous projects, and felt it to be the most expeditious. Under this arrangement, a Project Team, consisting of representatives of the client, and principals of the architectural, engineering, and construction consultant firms meet regulatly to plan, coordinate, and monitor all aspects of the design process. Unlike the more common arrangement - where the client deals solely with either the architect, a general contractor, or a project manager - the team management approach has the advantage of

avoiding the delays and misunderstandings that frequently arise when any one of the parties are in the position of having to seek approval for or explain decisions made in the absence of one of the others. By replacing the general contractor - who would normally become involved only when contracts are actually being awarded - with a construction consultant who is responsible from the outset for estimating and advising on costs, unnecessary or excessive expenditures can more easily be avoided. Since all parties are immediately aware of the effects of changes or delayed decisions, they tend to be more likely to avoid both. When changes are inevitable, however, they can be made more rapidly because of the presence of all concerned.

The structural, mechanical and electrical engineers were respectively, Robert Halsall & Associates, G. Granck & Associates, and Jack Chisvin & Associates. These well-established, medium-sized firms were selected and retained by the architect, with the approval of the Board.

Other consultants included Rolf Jensen & Associates (fire prevention), Environmental Acoustics (vibration and acoustics) and J.D. Kelly & Associates (hardware), all of which were retained directly by the Board on the recommendation of the architect. The construction consultant was the Charles Nolan Company which was selected from a short list of four firms on the basis of criteria established by the architect and approved by the Board, by which the firm was directly retained. Its responsibilities, in addition to cost estimating and budgeting, included scheduling, calling of tenders, and the administration, coordination, and supervision of contracts. With one or two minor exceptions, this group of consultants had worked with Moriyama previously.

The actual design of the building, and of all aspects of its construction were undertaken by a Design Team composed of all the members of the Project Team except for the client's representative. To minimize the duplication or overlap in authority attendant on projects of this scale, Moriyama, in consultation with the construction consultant, developed a list of responsibilities for each member of the team for each phase of the design process. The list was similar to one used on a previous job, amended to suit the requirements of the library project, and was incorporated into the contract document between the Library Board and the construction consultant.

Although each participant was, naturally, assumed to be primarily responsible for his respective area of expertise, all were expected to contribute to the project as a whole. This genuinely "team" approach was acknowledged in the fee arrangements which stipulated that all consultants be paid on the basis of a percentage of the total cost of construction, rather than on a percentage of the cost of the systems for which they bore direct responsibility. Typically, however, each step of the design began with architect-developed concepts. These formed the starting point for the work of the consultants who developed alternative methods of meeting the requirements indicated. Discussions among team members followed to determine the modifications necessary. Selections were then made on the basis of the information provided.

An example of this collaborative approach is provided by the design of the ceiling and lighting system in the library. After lighting levels appropriate to a library had been investigated, the electrical engineer

developed an initial design for a continuous suspended ceiling using partly enclosed fluorescent lamps that threw light upward onto the ceiling, i.e. indirect lighting. Moriyama, having found it necessary to reduce energy requirements, then asked the engineers to find a way of doing so. The engineers revised design consisted of suspending acoustic buffers with fluorescent fixtures mounted from above throwing light downwards, i.e., direct lighting. After some discussion, this was accepted by Moriyama, but modified from buffers suspended in two directions to a uni-directional system. This system was also determined by the design team to offer superior acoustic absorption and greater flexibility with respect to future changes in the building.

Design proceeded throughout the summer and fall of 1973 with November set as a target date for presentation to the public. Construction was slated to begin in early 1974. It was anticipated that demolition, excavation, and foundation work could proceed during the winter, permitting the Board to take advantage of the Federal Government's winter works program. As the initial design neared completion, a detailed estimate of the cost of construction was made, and a budget of $30,000,000 was established. On November 1, the Board asked Metro Council to approve this budget and to request OMB approval of additional borrowing. Metro Council approved the budget on November 13; the OMB approved the borrowing on December 14.

The proposed design unveiled in November was for an invited audience that included politicians, officials, representatives of the public, and the press. It was a rectangular building, 100 feet in height sheathed in mirrored glass on its west and south elevations, and set back 20 feet from Yonge Street and 14 feet from Asquith Avenue. The

interior featured a diagonally placed "atrium" open through five 20-foot high storeys, with stacks in the north-east corner. The main entrance was in the south-east corner, at Yonge Street and Asquith Avenue.

It was at this point that the North Midtown Planning Group - which had not been consulted since the presentation of the site selection and feasibility study and the preliminary design concepts, with which, it will be recalled, there was some dissatisfaction - began to play a significant role in the outcome of the project. For while the client approved of the scheme, the Planning Group was severely critical of many of its most prominent features. It argued that the proposed building was too high, that the materials selected for the exterior were not compatible with those of adjacent buildings, that underground connections to the subway should be provided, that a restaurant and other commercial facilities should be housed in the library's Yonge Street elevation, that the building should not be set back from Yonge Street, that it should contain a circulating library, that there was inadequate provision for street parks and parking, and that at least one building on the site, No. 10 Asquith, was of historical significance and should not be demolished.

Despite this reaction, the Board voted to proceed with the project and sought approval from Metro Council - which was responsible for funding, and for ensuring that major developments in Metro are compatible with its planning policies, and in accordance with zoning requirements along arterial roads such as Yonge Street. Although the

Metro Executive Committee recommended a two-month delay, and asked the Board to revise the scheme so as to reduce the height of the building, preserve No. 10 Asquith, and consult with the Planning Group, Metro Council - rejecting these recommendations - approved the "concept and general plans". Nevertheless, the Council did require the Board to hear further representations from the Planning Group.

Meanwhile, however, the Board found itself blocked from a different source. Having previously asked the City to exempt the project from the proposed 45-foot holding by-law, the Board was now informed that no such exemption would be forthcoming until Council was satisfied that the height and bulk of the proposed scheme was necessary for library purposes. The City also requested the Board to refrain from demolition of No. 10 Asquith. It did, however, approve use of the Yonge-Asquith site.

Still other problems emerged as it was discovered that as the proposed Library did not conform to existing zoning, and as the Commissioner of Roads and Traffic for Metro, supported by City Public Works, became embroiled in a dispute with the City Planning Staff over the issue of having a ten-foot setback along Yonge Street in order to provide more room for underground services. The City Planning staff argued that such a setback would destroy the visual continuity of the street.

By January 1974, it had become apparent that the time required to resolve all these issues would delay construction start-up substantially. To offset the ensuing escalation of construction costs, it was deemed necessary either to increase the budget or reduce the floor area of the building. The latter course was chosen - dropping the floor area to

325,000 square feet from the originally planned 400,000 square feet - thereby necessitating a revision of the building program as well as of the design.

From January to March 1974, the Project Team, a sub-committee of the North Midtown Planning Group, and representatives of the City Planning staff met to resolve the manifold problems. After long and difficult negotiations, a series of compromises were worked out to the nominal satisfaction of all concerned.

By the end of June, 1974, the building program and building design had been completely revised by the Board and its architect and his consultants, with input from the City and the North Midtown Planning Group. The attached drawings indicate that the character of the building had been substantially altered from that proposed in the initial scheme, and that in conformity with the wishes of the Planning Group, commercial uses had been provided along Yonge Street, and provision for future access to the subway had been included, as had a pedestrian route through the building. Much of the detailed design work remained to be done, but the essential elements of the building had been determined, agreed upon by those involved, and approved by the City.

From this point on, final design - working drawings, scheduling and budgeting - proceeded relatively smoothly. Consultation amongst the Project Team, relevant official bodies, and the North Midtown Planning Group continued to effect minor changes in various aspects of the scheme. In early 1975, approximately one year later than originally scheduled, the site was cleared.

Construction proceeded in March under the direction of the construction consultant. As originally agreed, sequentially tendered and awarded contracts were used for each segment of the work. Due to an unexpected decline in construction costs, some of the items deleted to save money were reinstated. Final decisions as to fixtures, furnishings, and finishes were made as construction continued. The building was substantially completed by June, 1977.

VI. FINDINGS - BOTH PROJECTS

Despite the numerous differences between these two projects - one having had an architectural firm as prime consultant, the other, an engineering firm; the vast difference in function, in time allocated, in public involvement, etc. - and the most obvious fact that generalizations made on the basis of but two examples are open to criticism, it seems evident that with respect to the division of responsibilities between engineers and architects, a number of conclusions can be drawn that might be justifiably assumed to be applicable to more projects than these two alone.

We suggested at the outset that we would seek first to determine which aspects of the design process were in conflict, distributed, or shared among architects, engineers, and other participants. While it is quite apparent that in the case of the library substantial conflict developed between the public and some municipal agencies on the one hand, and the client and his architect and consultants on the other, it is, nonetheless equally evident that the dispute was in no way an outgrowth of the working methods established between the architect and engineers - save that neither apparently pushed the client towards greater acceptance of public input. In the case of the library, there was some concern lest jobs be duplicated and so measures were taken from the outset to ensure that roles and responsibilities were clearly understood by all participants. This was not deemed necessary in the case of the Correctional Institute, perhaps as a function of greater experience on the part of the design team in having worked together previously, and of the project's having been far smaller. An additional aspect of the latter project that might have been a source of conflict, but in fact was not, was that architects and engineers were involved not

only in the design process, but in the approval process as well - both the user and purchasing clients having their own architects, and the latter its own engineers; nonetheless, accommodation to the requirements of the project itself appears to have taken precedence to any disputes which might have arisen.

As to distribution of responsibilities, some divergence between the two cases is evident owing to the differences in the way the projects were awarded. In the case of the library, the architect (who later became project architect) was involved in first the site selection, and then in the program development phases prior to having been confirmed as the architect for the entire project. While the former was undertaken with the assistance of a media consultant, the latter was done in consultation with the users and client, but in the absence of assistance from engineers. In the case of the correctional facility, site selection preceded hiring of the architect, but programming, while done almost exclusively by the architect in consultation with both user and purchasing client, also utilized engineers to the extent considered necessary to resolve problems in which it was recognized they would become involved further along in the design process.

Once these preliminary aspects had been dealt with, it is evident that both projects utilized the respective skills of the various professions in much the same way, despite vast organizational differences. In both cases, the architect was assumed to bear primary responsibility for the overall design of the building - its organization, layout, use of space, and the way it would look and feel - and the engineers were seen as bearing responsibility for designing support systems that would conform to, or enhance, the architect-developed plan.

As for shared responsibilities, it can be said that overall responsibility for the success of the project was perceived as a joint or shared venture. "Design" was a procedure engaged in by both professions, though the areas on which each worked was not shared; the engineers concentrating on various support systems, the architects on plan and layout.

It seems evident that in the context of a working relationship, the distinction between work best left to architects and that best left to engineers is clearly understood, even while specific tasks are shared.

It was also suggested at the outset that a second way of considering the issue of responsibility is to look not at separate tasks, but at the intentions, or major concerns for the end product. Three categories pertaining to the nature of the design process were delineated: these were for ensuring human health, safety, and security; accommodating the activities the building is intended to serve; and the perceptions and responses of the building's eventual users.

As to safety, health, and security, it should be clear that building codes, fire codes, and standards governing the manufacture of materials all require anyone and everyone involved in a building's design to meet a certain minimum standard. Beyond this, it is apparent that while architects take into account the nature and requirements of the systems that will ensure safety (e.g. structural,mechanical, electrical, etc.) in the course of their design work, it is the function of the engineers - each working within the confines of his respective discipline - to elaborate on these systems, point out deficiencies in the design that will hamper their effective functioning, suggest improvements that would facilitate their functioning, and devise means of accommodating the architectural concepts

in the course of designing them - and to do all of these things in consultation with the architect.

As for the accommodation of the intended human activities, this was primarily the responsibility and concern of the architect in both projects. As one engineer put it in describing the distinction between the functions of each profession, "Architects design 'people buildings', engineers design 'works'. We worry about the circulation of air, they worry about the circulation of people." It might be added that successful accommodation is also a function of the client's knowing what he wants, and the architect's and engineer's ability to make sure they understand the client's requirements. The client must then also be able to recognize whether or not what he wants has been met in the plan.

At the same time, the work of the various engineers involved in the design process can directly determine the success of the architectural intention. The systems designed by engineers can alter, improve, or hamper the effectiveness of the architect's ability to succeed in accommodating the intended human activities. In both these cases examined here, reliance on the work of engineers on the part of the architect was both extensive and continuous throughout the course of the job.

It is apparent that the concern for accommodating human activity leads directly to a concern for the user's perceptions of and responses to a building. In both cases, again, the architects made little distinction between this and the preceding concern, both feeling that meeting the client's needs necessarily entailed designing a building that would meet more than the bare bones of the programmatic requirements. In the case of the Brampton Institute, the architect strived to meet the client's

desire for a non-institutional setting, and his intention is clearly visible in the layout as a whole; so too with the library. Because of the criticism of the North Midtown Planning Group of the failure of the design to meet certain requirements, it was the architect to whom the responsibility for improvement of the design fell, mainly because it was his responsibility in the first place. In addition Moriyama stressed throughout the project that the building should not only incorporate the activities of book storage, circulation, and cataloguing, but should also promote self-directed study, by being open in its design and inviting to passersby. It should be noted that the degree of success in fulfilling this concern is not the issue here, but rather the origin and responsibility for attempting to fulfill it. Architects and engineers agreed that such concern was a vital aspect of architectural training, while engineers suggested that it was far more a matter of personal preference or a skill acquired through practical experience.

During the course of compiling information for the case studies, many of those interviewed were asked to explain their views on the roles and relationships between the respective professions. Interestingly, almost every one of them groped for a metaphor. The one most frequently employed was that of the architect as general practitioner, with the engineer as specialist. Said one man, "If I have a toothache, I go to a dentist - that's like going to an engineer to have a bridge built. But if anything else is wrong, first I go to the G.P., and if he can't help me himself, it's his job to know where to send me - and that's like going to an architect."

Architects and engineers suggested over and over that the architect's job is to deal with the aspects of a building relating to human use - layout, massing, and the circulation of people. To design a building, the architect must take into account its structural and mechanical requirements, those things are integral to the total design. But it is not incumbent upon him to figure out all their details. In the case of the library, engineers played a major role in creating some of the effects the architect desired from the lighting system, making their contribution to the feel, or aesthetic, of the building substantial. At Brampton meanwhile, the structural engineer suggested that it is so structurally simple that any architect could have done the bulk of the work without substantial engineering input. Several engineers stressed that the buildings with which they were accustomed to deal were those designed to accommodate processes - specifically industrial processes - rather than people. Clients for such buildings know exactly what they want; they arrive with programs and specifications already in their pockets. Some industries, in fact, are so secretive about what goes into their buildings that even the engineers designing the facilities never find out exactly what goes on inside. Architects on the other hand, devote considerable time and energy to figure out what goes on, and how to best accommodate it.

A final, and unanticipated finding of these studies was that both projects, despite their obvious differences, were managed in much the same way, and that the nature of the management employed in both, while not exactly new, is one those involved felt to be both on the increase and logically so. On the surface, the two seem quite different. Giffels offers all project management services on an in-house basis.

For this particular job, in addition to an internal project manager -the architect - there was also an external, third party administrator formally charged with interceding between the architect (i.e. Giffels), and the client. Moriyama, on the other hand, simply offers architectural and planning services. He was hired directly by the client, and sought the necessary consultants elsewhere. Nonetheless, both architects operated on a team basis, and felt that the team approach is beneficial to both participating practitioners and the project. Furthermore, despite the formal existence of a third-party administrator on the Brampton job, no time was wasted by any of those involved in establishing a direct working relationship-among all parties involved - engineers, architects, and the various clients. It would seem that whatever the formal arrangements, a team approach that also permits input at all stages of the project from diverse disciplines and interests is one that will be more widely explored as construction becomes more technologically complex and as clients become more environmentally conscious and sophisticated about their requirements.

The fact that the primary consultant was in one case an architectural firm, and in the other an engineering firm (albeit with an architect in charge) was perceived as having made a difference to only one person - and he was unable to explain how. At Giffels, where the interdisciplinary team approach has been employed since its inception, both architects and engineers were quick to stress its mutual benefits: the architects become more conscious of engineer's concerns for cost and efficiency, while the engineers become more conscious of the architect's concern for the quality of the environment. All those involved felt the relationship to be a genuinely symbiotic one.

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